



Chapter 5: Develop a Local Action Plan

Table of Contents:

Stakeholder Engagement.....	2
Best Bets	
<i>Municipal Operations</i>	
Buildings	17
Infrastructure	36
Municipal Transportation.....	55
Waste Reduction & Recycling.....	71
City Purchasing	76
Utilities	85
<i>Municipal Interface with Residents and Businesses</i>	
Businesses	95
Residential Homes	107
Residential Transportation	124
Long Term Initiatives	
Urban Planning	144
Agriculture	152
Transition to Alternative Fuels	158
Sustainable Energy	168
Education	190
Waste Management	196
Reducing Impact of Continued Emissions	207
Adapting to Climate Change	219



Chapter 5: Develop a Local Action Plan Stakeholder Engagement

DOCUMENT CONTENTS

Government Leaders and Municipal Staff.....	3
Non- profit Organizations and Local Activists.....	4
Business Leaders.....	4
Community Members.....	4
Stakeholder Engagement Strategies.....	4
LASER Stakeholder Recruitment.....	5
Tools of Change: Social Marketing to Engage Stakeholders.....	11
Business for Social Responsibility: Organizational Stakeholder Engagement.....	12
Additional Resources.....	15

In a democracy, four groups (local governments including their city staff, community members, organizations and activists, business leaders and citizens) will have a stake in any program to protect the climate, and should be involved in the creation of the plan. Whether your city has decided to engage stakeholders in the goal setting process or has decided to announce a climate protection agreement as an executive action, learning how to engage the various people in your community who will be interested is an important step in developing and following through with Climate Action Plan programs. Many of the programs described in this manual can only be done with the support and enthusiasm of the community.

Government Leaders and Municipal Staff

If you are reading this manual it is likely that you are already engaged in Climate Protection. To ensure that your town makes climate protection a priority, it will be necessary to involve city officials and staff.

Mayors who sign the Mayor's Climate Protection Agreement (MCPA)¹ commit themselves to reduce GHG emissions. In most cities, however, programs to achieve reductions will be implemented by city staff. These individuals will oversee programs to save energy, to educate the public, and to work with the community. They will measure the impacts of programs, and will make adjustments as the programs unfold. Staff members may know little at first about global warming or the science behind it. An internal education program to bring city staff up to speed on the issue is important. With support of local non-profits, such educational materials as this manual, trainings, and attendance at conferences and workshops, staff can get the support they will need to implement a successful Climate Action Plan. Resources

for city staff are listed at the end of this chapter.

A good first step is to determine whether your community has signed the MCPA. If not, consider whether your Mayor might be interested in joining the over 355 mayors around the country who have.

Research has shown that even in many of the cities in which the mayor signed the MCPA, city staff members were unaware of this and uncertain how to proceed.² Remember that in any entity as large as a city government, there are differences of opinion, and a whole array of historical vested interests. Often climate protection programs originate in an environmental office, or an executive office. Officials in public works, utility services, vehicle operations and other departments may not view proposed changes as enthusiastically. It will be important to ensure that these people are given a way to get involved, that their opinions are heard and their expertise solicited.

Even if a mayor has signed the Agreement, city staff may be unsure which steps to take next. One of the first actions to consider is to embody the commitment in a formal

resolution of the city government.³ Passing such a resolution not only highlights the importance of climate change to elected officials. It also offers an opportunity to educate the public and the local government staff while laying out a plan of action and implementation. Some cities have proceeded without such a resolution, but going through the political process to make the Agreement official will help give it legitimacy and longevity.

Resolutions that cities have passed may be helpful models for government staff:

For a sample resolution outlining a city's commitment, view the city of Seattle Resolution.⁴

View a sample resolution⁵ from a city participating in ICLEI's Cities for Climate Protection Campaign.

The sample above can be modified to include language specific to a particular community. See how the city of Carbondale, Colorado⁶ has personalized its resolution.

City staff has the power to place climate protection as a high priority, or to undermine efforts even if the mayor believes this should be a focus. Helping staff

¹ Seattle U.S. Mayor's Climate Protection Agreement website, www.seattle.gov/mayor/climate/, 8 October 2006.

² Natural Capitalism Solutions called every city that had signed the MCPA as of November 2005. At least 75% of officials surveyed were unaware that their city was officially a member. Most of the rest were unsure what if any programs were being undertaken.

³ ICLEI's first responder handbook.

⁴ Seattle's Resolution, clerk.ci.seattle.wa.us/%7Escripts/nph-brs.exe?s1=&s2=&s3=30316&s4=&Sect4=AND&I=20&Sect1=IMAGE&Sect2=THESON&Sect3=PLURON&Sect5=RESN1&Sect6=HITOF&d=RESN&p=1&u=/%7Epublic/resn1.htm&r=1&f=G, 20 October 2006.

⁵ ICLEI Sample Resolution, www.iclei.org/documents/USA/resolution.pdf, www.climatemanual.org/Cities/Chapter5/ICLEI_SampleResolution.pdf, 20 October 2006.

⁶ Carbondale Resolution to Participate in Cities Climate Protection Campaign, www.carbondalegov.org/vertical/Sites/%7BE239F6F5-CCA3-4F3A-8B27-95E8145FD79A%7D/uploads/%7B736D98B2-4F2F-404F-B554-B024DA1CDAA8%7D.PDF#search=%22carbondale%20colorado%20ccp%22, also archived at, www.climatemanual.org/Cities/Chapter5/Carbondale_CCP_resolution.pdf, 20 October 2006.

to understand the importance of the issue, their role in achieving climate protection and how this can improve their work on behalf of their community can dramatically strengthen a program.

Non- profit Organizations and Local Activists

Many non-profit organizations work on climate protection, from the local level to the national stage. Some groups bring pressure for change, while others provide excellent information. Some can even provide financial support for carbon reduction programs. For example, the information in this manual is available due to the partnership between Natural Capitalism Solutions a non-profit, and Paradigm Nouveau, a L.L.C., for-profit company. The city of Ballard, Washington's 'carbon neutral' goals are being put forth and implemented by the local non-profit, Net Green. Many NGOs, local and national non-profits can bring specialized resources to help stakeholder groups in planning and implementation. The city of Denver, Colorado conducted its carbon baseline by using local university students, supervised by a professor working with city staff. Many houses of worship have made climate protection a priority, reducing the energy that they use, holding educational programs for their members and speaking out on the issue

Program planning efforts will benefit from inviting all interested elements of civil society to be involved at the earliest possible stage.

Business Leaders

Business and community leaders should be invited to participate in a climate protection program at the earliest possible moment. Often business leaders are ignored as such programs are developed, and may feel that proposed changes will negatively impact their businesses. In fact, many carbon reduction programs will save businesses money and will strengthen the entire economy, but unless the business case is explained, the commercial sector may react negatively. The Business Case for Climate Protection section in the Why Act Now chapter of this manual contains information that can be provided to members of the business community. The early participation of business and community leaders will significantly improve chances for success.

Community Members

Finally, even the most aggressive program will fail unless citizens understand and give it legitimacy. It is crucially important to educate and involve citizens at every step of a climate protection process. Many mayors have taken a leadership role by signing the Climate Protection Agreement. But

achieving reductions, especially significant ones will depend on the willingness of the public to participate.

Like business leaders, many citizens may feel that protecting the climate will cost them money, require higher taxes, stifle their quality of life and otherwise bring changes that they will not like. It is important to explain how reducing the use of energy saves money, increases community security, strengthens the economy and can be achieved with a minimum of disruption. It is also worth helping the community to understand the significant disruption that will come from allowing global warming to continue. An educated citizenry is one of the best assets that any community can have.

Stakeholder Engagement Strategies

Cities can take many approaches to engage its stakeholders. This manual presents several strategies so that you can determine which one works best for you. The following three strategies: LASER, Tools of Change and Businesses for Social Responsibility lay out specific steps organizations can follow to engage their stakeholders. Each have a different audience and purpose, but follow similar processes.

LASER, Local Action for Sustainable Economic Renewal, created by Global Community Initiatives⁷ and Natural Capitalism Solutions⁸ was developed for use in communities interested in economic renewal and in developing sustainability programs. This free tool offers an array of best practices, tools and templates that communities throughout the world can use. You can download it for free through an interactive web site.⁹ In the first chapter, LASER describes the stakeholder recruitment process and the importance of creating a community vision to bring the community together and motivate it to achieve its goal.

Tools of Change¹⁰ is founded on the principles of [community-based social marketing](#). The web site offers specific tools, case studies, and a planning guide to help people take actions and adopt habits that promote health and/or are more environmentally-friendly. The web site includes the best practices of many other programs - practices that have already been successful in changing people's behavior. The planning guide describes the step-by-step processes necessary to change a community's behaviors. This site also provides information on clear tools to use in addressing different audiences.

Business for Social Responsibility¹¹ (BSR) is a non-profit organization that provides information, tools, training and advisory services to make corporate social responsibility an integral part of a business' operations and strategies. BSR describes the importance of engaging the business community, beyond just "touching base." It provides clear implementation steps to achieve success. It is especially important to present the business case for climate protection (see Chapter 2 of this manual for how to present this). Showing how the climate change programs described in this manual make business and financial sense is an important message. A strong program is much easier to deliver to local businesses, residents and city planners if it makes economic as well as environmental sense.

LASER Stakeholder Recruitment

The following is adapted from LASER's Stakeholder Recruitment and Community Visioning Process.¹² Although LASER was written with a focus on community sustainability and economic renewal, not specifically climate protection, the stakeholder engagement process has proven successful in communities around the world.

The first step in the process of developing necessary leadership is to identify and recruit the stakeholders from the community who have an active interest in a sustainable future. The legitimacy of the process will depend, in part, on who is doing the recruiting and how the Stakeholder Group derives its legitimacy. No matter who you are—mayor, municipal employee, business leader, community activist—you need allies to enable a major carbon reduction effort to succeed.

Step One: Gather a Core Team

The Core Team could be as small as three people, but should not be much larger than seven to ten. It should include people who have credibility within the community. Ideally, it will ideally reflect experience from such sectors as business, government and civil society. The Core Team should agree on the general direction of the project and work to become a functional unit before reaching out to the rest of the community. At a minimum, those you select for your Core Team should have thoughtful and optimistic personalities, good interpersonal skills and a capacity to have fun together while getting hard work done.

⁷ Global Community Initiatives, www.global-community.org/, 15 October 2006.

⁸ Natural Capitalism Solutions, www.natcapsolutions.org, 15 October 2006.

⁹ LASER Interactive Site, www.global-laser.org/, 15 October 2006.

¹⁰ Tools of Change, www.toolsofchange.com/English/planningguide.asp, 15 October 2006.

¹¹ Business for Social Responsibility, www.bsr.org/Meta/About/index.cfm, 15 October 2006.

¹² Chapter One of LASER, www.global-laser.org/workbook/LASER_guide_Ch1.pdf, 30 October 2006.

Consider the following sources of potential candidates:

Local activists within or outside local government

Members of governmental boards or commissions

Leaders of organizations dedicated to community improvement

Leaders of organizations working on environmental issues

Local Service Clubs: Rotary, Lions, etc.

Local youth leaders

Businesses that benefit most from a healthy community

Leaders of Faith Communities

The initial responsibilities of the Core Team include:

Identifying the scope of the project

Developing a budget and planning schedule

Recruiting a Stakeholder Group

Identifying the other plans and processes that need to be integrated

Preparing the materials and presentations that will be used to invite others to participate.

Step Two: Gather Stakeholder Group¹³

A Stakeholder Group gathers a representative number of interested parties together. A group of 30–40 people is an effective size, but it can be as many as a couple hundred, depending on the needs of the community. This group will provide the leadership in creating a shared vision and plan for local climate protection. In addition to a broad cross-section of the community, the Stakeholder Group can include all the various town leaders—department heads, for example, and the heads of significant local institutions. They all will benefit when others see the links between what they do and the value they add to the community as a whole.

Different Businesses	Organized civil society groups
<ul style="list-style-type: none"> • Small, medium and large businesses • CO₂ intensive and non-intensive businesses • Businesses with old and new technology that addresses climate 	<ul style="list-style-type: none"> • Schools and universities • Service organizations • Churches • Environmental Groups

Figure: Stakeholder Organizations to Take Into Consideration

To recruit business leaders to the process, it is important to understand what will motivate them. For example businesses may be more motivated by other business leaders than government or community organizations, so recruiting a prominent business person early on increases the likelihood of others becoming involved. Giving the business people credit and publicity for their involvement will appeal to their

interests. Be prepared to take some additional time and effort to meet with different business people, get their feedback and suggestions for how the process should work, and help them understand all the benefits of a more vibrant local economy

You may want to set up special meetings initially for various stakeholder groups, to help them feel at home in the process and have a voice in the way it is

structured. This may mean meeting for breakfast instead of in the evenings, for example and having very specific and short agendas with clear outcomes. Empowerment—the clear connection between what people suggest and decide and the way a public process works—is one of the most successful ways to engage people and keep them engaged. Disempowerment—overriding decisions that don't fit with the style of city leadership

¹³ Additional Stakeholder Recruitment Tool from LASER, www.global-laser.org/resources/stakeholder_recruitment.pdf, 20 October 2006.

or reversing course midstream without consultation—is an equally sure way to make people drop out of processes like this.

Step Three: Develop Group Process Skills

Once the Stakeholder Group has been convened, it is important that they develop a shared idea about how they will work together, how meetings will be conducted, what the planning schedule will be and how conflict will be resolved.

Step Four: Learn to Manage Conflict and Make Decisions¹⁴

All teams must recognize the need for non-violent approaches to relationships, both within their groups and in the community at large. Moreover, the members of these groups will need to accept a responsibility for helping community members to communicate peacefully, no matter how impassioned they may be.

It is also helpful to have decision-making structures articulated in advance, so conflict will not emerge simply because the decision-making process is unclear or ineffective. The exact form that conflict resolution and decision-making procedures will take can vary depending on the group involved and its particular constraints. Part of any conflict management procedure should be a clear articulation of the Vision Statement, Mission and conflict resolution criteria. Achieving agreement on these matters in advance makes it possible to

guide decisions through any later conflict that may arise.

Participatory Visioning

It is important to first create a shared vision for the community as a whole, one that looks into the future and captures the collective aspirations of the people. To achieve the goal of a democratically-created local vision, you will need to inspire and motivate your fellow citizens—not only to support the vision, but to take an active role in defining it.

A vision is a positive forecast of the way we want the world to be, an affirmation of values and hopes, an image of the destination to guide our journey. The language of the Vision must be simple enough so anybody can understand and get excited about it. It must reflect shared values and convincingly depict a community changed for the better. The process of defining your Vision should be future oriented, and allow people to bring their imagination, their creativity and their hearts.

When visioning processes work, they motivate people to conceive new ventures and new activities, to create unexpected opportunities that would not have arisen if it weren't for the collective creativity put to work and the new connections made. Visions that reflect the community's aspirations can generate goals that people will want to work for, and make it easier to develop practical strategies and targets.

How is it possible to articulate a shared vision for an entire community? This is a huge task, and one that can easily fail if you don't take the time to engage the whole community in the process.

Not only must a vision reflect the core values of the people, it must come from the people. A vision statement drafted by a few people in leadership—even with the best intentions—will never engender the sense of ownership and common purpose that comes from full community participation. That is why it is important to work through the public participation process.

Depending on the size of your community, recruiting participation can be done by asking the community to submit vision statements through the media, or holding a community meeting where individuals can voice their opinions, etc.

The public participation process can generate an enormous amount of information about what people want to see in the future. In the city of Calgary, over 18,000 people answered the questions the Stakeholder Group asked the community—online, at festivals, in schools, during meetings, on the street, in their workplaces, in their utility bills and in the newspapers. Your Stakeholder Group will have to find a way to compile and digest all the information that is collected. The more successful the public participation activities have been, the more daunting this project will be.

¹⁴ LASER provides an example of the decision making process, www.global-laser.org/resources/decision-making_sample.pdf, 20 October 2006.

The Stakeholder Group might want to set up a subcommittee to read all the information and prepare a report. This subcommittee could also take responsibility for preparing the first draft of a vision statement.

Even if the vision is properly developed, truly reflecting the hopes and aspirations of the community, it can still fail in its purpose if the leaders don't "get it"—if they see it only as words on paper. A leadership that shares the vision will respond to its community with excitement and a sense of possibility. Among citizens, likewise, an inspiring vision statement can create a wellspring of energy and commitment.

Creating Excitement and Momentum

The basic premise of this approach is that genuine community transformation is built on vision, imagination, courage and other human qualities that unite us across our differences. People do not necessarily get excited about a meeting to discuss new types of loan funds, but they do care about preserving what is special about their home towns. They care about their own ideas being heard in the process. In every stage of your activities, from initial surveying to the final adoption of the plan, you can draw on the creative and spiritual resources of your community through the arts, celebrations, challenges, friendly competition and even humor.

Asking the Right Questions

One of the first tasks a Stakeholder Group can take on is to develop a set of questions to

elicit meaningful feedback from the community about the future in general. This is not so much to gather data as it is to identify hopes and dreams (the data will come later). The questions should be broad in nature, but can also touch on specific issues. The important thing is to keep the questions open-ended and positive. In this way, even comments about problems can contain the seeds of their own solutions. The following visioning questions were used successfully by the city of Calgary's imagine Calgary Project:

What do you care about in Calgary that you want to pass on to future generations?

What is it like for you to live here?

What changes would you most like to see?

What are your hopes and dreams for Calgary in 100 years?

How could you make this happen?

Examples of Climate Related Questions that would work well:

How could climate change influence our community?

How can you reduce the use of energy?

What are ways our community could benefit from energy efficiency, renewable fuels, or less traffic?

How could you contribute to protecting our climate?

Notice how the questions are positive, action oriented and personal. This is the type of inquiry that will elicit the most useful information.

Establishing a campaign theme can help to galvanize public interest in creating a Vision. Seattle Washington, for example, named their initiative "Sustainable Seattle." Many communities pick a year on the horizon—maybe 20 or 30 years in the future—and incorporate that. Hamilton, Ontario calls their effort "VISION 2020." All your efforts at this stage will emphasize the future of the community.

Ideas for Public Participation

As noted earlier, your planning project will gain real political support if the broader public understands and supports it. The Stakeholder Group should identify messages they want each member to convey to his or her own constituency, from business to labor to youth to neighborhood interests.

Beyond this targeted approach, broad community involvement is also essential. To create this, you need to make creative use of a variety of resources, including mainstream and community media, publicity efforts, events, and visuals. This public participation campaign will establish the spirit of genuine two-way communication. The trick is to create a buzz and find new ways to listen to people at the same time.

Here are some examples to improve community involvement:

Invite ideas:

Put up a big suggestion box in front of town hall, and ask a popular radio commentator to read a suggestion each week. Have an essay contest on topics related to global warming—what are the risks of the future in the community, or how your community could be the “Climate Protection Capital of the World”. Create contests for ideas or change within school systems.

Create an online buzz:

Start a community-wide Internet listserv. Develop a web page on which anyone can contribute his or her thoughts, events and community building ideas. Do training with local high school students on using interactive software and ask them to help their parents get involved.

Town Hall Meetings:

Facilitate the organization of citizen-led meetings to mobilize public participation in identifying community priorities. Elect representative community development groups to plan local initiatives and build dialogue and cooperation with local governments.

Good news:

Start sending press releases to local papers, telling them about good things that have happened and people who have made a difference—from the students who are turning out lights in classrooms to the elders who are switching to compact fluorescent light bulbs downtown. As your climate protection initiative generates ideas and makes people aware of the good work

already going on, this can become a steady source of good news. Follow up with reporters and editors and keep your eyes open for advertising sponsors to underwrite their coverage.

Art:

Pull together the artists in your community for a public art event to create the future. Find a big canvas that everyone can draw on. Make musical instruments available for improvisation. Bring recycled materials for people to make sculptures. Have lots of food and activities for young children.

Celebration of Assets:

Every single community has something it can celebrate. Find an excuse for a party, line up some local sponsors, and celebrate what the community will look like in 5, 10, or 20 years. A futuristic birthday party. Have a parade. Invite politicians to dress like they’ll look in 15 years. Invite young people to be the politicians for a day. Make a huge paper maché statue in the middle of town to commemorate the celebration.

Challenge:

People like a challenge. They like friendly competition, and demonstrating what they do well. Sponsor a prize for the local business with the highest score on energy efficiency. Give awards to people who have made the world safe for our grandchildren.

Humor:

Find ways to make people laugh, from street theatre to standup comedy. The tough issues facing communities may

not be funny, but our mistakes dealing with them usually are.

Climate activists have been preaching environmental disaster as a sole motivator for far too long. People are not motivated by fear and guilt as effectively as they are by hope and novelty.

The main message about engaging all sorts of different groups that can be considered “the public” is to go to them and meet them on their terms, rather than having them come to you. Ask to be put on the agenda for their regular meetings; attend the festivals and functions; get invited to speak at their clubs, churches, synagogues, mosques and community suppers—all of these are as important as holding meetings at city hall.

Within the business community it is important to appeal to the things that businesses find important. Find ways to promote those businesses that are participating in your project, such that other businesses want to get on the bandwagon. Full page ads with business logos, news stories about how a particular business is cutting its emissions, awards to businesses for innovation, future thinking, community service—all of these techniques will help you win credibility and participation from a group that is often slow to get involved. Portland, Oregon does this by awarding the BEST (Businesses for Environmentally Sustainable Tomorrow) award each year to seven different companies demonstrating excellence in business practices that promote economic growth and environmental benefits.

They post the winners on their web site and hold an award ceremony to present the award to each winning organization.¹⁵

Completing the Vision

Once the stakeholders have come up with a draft vision statement, bring it back to the community to discover whether it captures their ideas adequately. Publishing it in the paper with an easy way to respond, discussing it at city council meetings, holding meetings with many of the same groups that contributed at the outset—all of these techniques can help the Stakeholder Group determine if what they have drafted successfully reflects the aspirations of the community.

The Vision should be a short, inspirational, compelling statement about what the community wants for the future. Ideally, it will reflect all the different aspects of community life, not just economic goals. This is because a climate protection effort will find its most promising initiatives in things that meet the broad spectrum of human needs.

The following excerpt for Cambridge, Massachusetts' Climate Protection Plan¹⁶ is a good example of how a vision statement around climate protection can be worded.

Vision Statement¹⁷

In 2025, we see our world and city doing things better and smarter. We live and work in “energy smart” buildings that use readily

available technology to maximize energy efficiency. Computerized controls on heating, cooling, and lighting systems automatically adjust for daylight levels and turn off when rooms are vacated. Appliances and office equipment use much less energy for the tasks they perform. Geothermal heat pumps eliminate the need for furnaces and boilers in many buildings. The demand for energy conservation services has created a bustling industry with well-paying jobs. Compared to 1990, citywide energy use is down by 50%.

Cambridge also has dramatically reduced its reliance on centralized electricity systems. Buildings do not just consume electricity; they also produce power. Some have fuel cells that provide the energy reliability important to Internet businesses, biotech laboratories, and public safety operations. Solar photovoltaic panels and roof tiles are common; any excess power they produce is sold into the regional electricity grid, allowing the building owners to run their meters backwards.

Solar thermal systems are installed to heat air and to produce hot water, reducing the need for fuel and electricity. Where electricity from the regional grid is still

needed, users have negotiated contracts with suppliers, often through group buying programs, to buy electricity from renewable sources. Consumer demand is driving the installation of wind power turbines in the Berkshires and offshore, large-scale fuel cell facilities are running on hydrogen, and landfill gas is being recovered to generate electricity. Where renewable energy supply is insufficient, natural gas fuels clean-burning combined cycle generators.

Rooftop gardens and green roofs are routinely installed on buildings of all types to reduce the need for air conditioners in the summer and to reduce storm water runoff to the Charles and Mystic rivers. The city's tree canopy has expanded as a result of aggressive planting and maintenance, reducing energy needs for adjacent buildings and increasing shading to offset the urban heat island effect. There is enough quantity and variety of vegetation to support songbirds, and the shaded sidewalks and pleasant open space encourage people to enjoy the city in summer instead of fleeing the heat.

Fewer cars with single occupants are seen on the road. The regional transit system has expanded in response to demand for more and better service. Vehicles

¹⁵ Portland BEST Awards, www.portlandonline.com/osd/index.cfm?c=41891, 22 September 2006.

¹⁶ City of Cambridge Climate Protection Plan, www.ci.cambridge.ma.us/CDD/et/env/clim_plan/clim_plan_full.pdf, 30 October 2006, also archived at, www.climatemanual.org/Cities/Chapter5/Cambridge_ClimatePlan.pdf, 30 October 2006.

¹⁷ Cambridge Vision Statement, www.ci.cambridge.ma.us/CDD/et/env/clim_plan/clim_plan_3.pdf, 30 October 2006, also archived at, www.climatemanual.org/Cities/Chapter5/Cambridge_visionstatement.pdf, 30 October 2006.

running on alternative fuels, hybrid technology, and fuel cells have replaced diesel buses. Cyclists and pedestrians dominate the street instead of automobiles, since mixed use neighborhoods mean many destinations are within walking or biking distance. With so many people on the street, crime is significantly lower; with so many fewer cars, the streets are safer for everyone.

Very little material is thrown away. Products are increasingly made out of recycled materials. Manufacturers and retailers take back old products for refurbishing or recycling. The city provides a welcome home for diverse communities with its clean air, safe neighborhoods, and easy access to jobs, services, and recreation. Children have a sense that they are partners with adults as community stewards, and the city is safe for them to explore.

As a result of all these changes, the buildup of greenhouse gases in the atmosphere is abating and the threat of climate change is diminishing. While past emissions have caused the climate to shift, changing precipitation patterns, average temperatures, and sea level, scientists have lowered their concern about the scale of the impacts. This has happened because the

previous generation recognized the problem and chose to modify their ways to protect future generations.

LASER provides a database of communities both throughout the workbook and as additional resources on its web site.¹⁸

Tools of Change: Social Marketing to Engage Stakeholders

The following information comes from the Tools of Change web site. Their planning guide is designed to help organizations plan, by providing space on the web site to insert their own plans and programs. The planning Stages for any program to engage community members¹⁹ process is broken down into the seven sections below. More detail on each section is available on the web site.

1. Setting Objectives
2. Developing Partners
3. Getting Informed
4. Targeting the Audience
5. Choosing Tools of Change
6. Financing the Program
7. Measuring Achievement

Setting Objectives

In this stage you will work to identify the objectives you aim to achieve. This should be done through first evaluating the current situation, then setting the specific actions you want your stakeholders to undertake. You must also determine measurable objectives and how you are going to measure the success of meeting those objectives.

Developing Partners

Determine what/if any organizations you would like to partner with to achieve your objectives. Make sure to assess the pros and cons of partnering with each organization, what can you benefit from in particular from working with each organization.

Getting Informed

It is important to gather as much information around the subject prior to engaging your stakeholders. This means doing literature reviews, speaking with area experts, contacting other cities with similar programs, and getting a sense of your communities existing opinions and behaviors.

Targeting the Audience

Determine what group of people you most want to reach through your program. Who will have the greatest opportunity to change their behavior and reduce GHG emissions? What group of people are already interested, but do not have the information to act?

Choosing Tools of Change

You must decide now how to best motivate action in your target audience. What tools will engage individuals to make changes, continue the momentum of programs, spread the education, and remind individuals to act. This will also involve creating an effective marketing mix with a variety of messages and language.

¹⁸ LASER Database, www.global-laser.org/cgi/laser/advancedsearch.html?id=o2Yco9Qc, 15 October 2006.

¹⁹ Tools of Change, www.toolsofchange.com/English/planningguide.asp, 15 October 2006.

Important strategies to engage community members are:²⁰

- Building Motivation Over Time
- Feedback
- Financial Incentives and Disincentives
- Norm Appeals
- Obtaining a Commitment
- Overcoming Specific Barriers
- Prompts
- Vivid, Personalized Communication
- Home Visits Mass Media
- Neighborhood Coaches and Block Leaders
- Peer Support Groups
- School Programs that Involve the Family
- Word-of-mouth
- Work Programs that Influence the Home

Financing the Program

The best way to ensure a program will continue over time is to design it to pay for itself. To achieve this goal it is important to:

Assess the value of and charge for the promotional opportunities you provide (coupons, demonstrations, referrals, advertising, public relations opportunities). What other promotional opportunities could you offer?

Assess the value of and charge for the products and services you provide. What other products and services would add value for your participants?

Choose low cost/low

maintenance/high impact program activities

- These programs are highlighted in the Best Bets Section of Chapter 5.

Obtain funding from partners who benefit from your program or who want to encourage what you are doing.

Tie program activities to ones already being carried out by your organization and its partners

- City of Boulder is working with its utility, Xcel, to assess carbon fees (based on a successful 2006 Ballot Measure) on Boulder's residents and businesses.²¹

Establish partnerships with program delivery organizations, such as service clubs and community associations, who can offer volunteer labor on an ongoing basis

Measuring Achievement

It is important for any program to decide what measures to monitor frequently or at major milestones. For programs designed to educate, it might make sense to have a control group. Measuring and reporting performance is discussed later in this manual, Chapter 7: Monitor and Verify Results.

Tools of Change provides numerous case studies about organizations and the specific programs and social marketing tools they used to be successful.²²

Business for Social Responsibility: Organizational Stakeholder Engagement²³

Steps that businesses can use to engage their stakeholders are very similar to the measures city officials can use to involve the community in Climate Protection:

Business for Social Responsibility (BSR) is a leading global resource for the business community and thought leaders around the world. BSR equips its member companies with the expertise to design and implement successful, socially responsible business policies, practices and processes.

According to BSR, company approaches to developing stakeholder engagement are as many and varied as the types of engagement and the companies' motivations behind them, which range from crisis management to business strategy development. Regardless of the type of engagement, these key issues should be considered:

Build the Business Case

This is the first and most important step before entering into stakeholder engagements. Determine the specific goals being addressed and how the stakeholder relationship will help meet those goals. Whatever the goal, it should be articulated as specifically as possible. Among other things, this will help "sell" the benefits of the stakeholder relationship to and help stakeholders understand why the

²⁰ Tools of Change, www.toolsofchange.com/English/toolsofchange.asp, 15 October 2006.

²¹ The Climate Action Plan Tax (CAP-T), Measure 202 on Fall 2006 ballot, is a tax on electricity bills. www.climatesmartboulder.org/how.html, 15 October 2006.

²² Tools of Change Case Studies, www.toolsofchange.com/English/casestudies.asp, 15 October 2006.

parties are entering into this relationship.

Examine Costs, Opportunities and Risks

Part of the business case should include a rough cost-benefit assessment of the actions proposed. Costs can include the time, personnel, and resources that need to be committed to the relationship, the potential loss of market share or reputation that could result if things go poorly, and potential negative reaction among shareholders. It also is important to consider the risks associated with not acting at all. At the same time, take stock of the potential opportunities, including improved access to new markets, increased sales, greater public support (which could translate into tolerance of future mistakes or mishaps), improved morale, and enhanced satisfaction.

Do Your Homework

Identify potential stakeholder organizations with which to partner or engage, and conduct due diligence before contacting them. Use leaders of stakeholder groups to identify other individuals or groups who should be involved. Each stakeholder group has unique issues, interests, and willingness to engage in a partnership or dialogue. Learn about organizations with which you share vision or values, and, when appropriate, be willing to engage even your toughest critics. Find out each organization's motivations for partnering with you. Check a potential partner's reputation, read its publications,

scan its web site, and research media clips about the group. Check references: Was the group open-minded, fair, and positive? Did it keep its promises?

Understand Expectations

Important factors to consider before actual engagement are the expectations of stakeholders from engagement. What are the respective drivers for stakeholder engagement and how will they influence the initial basis for understanding? Are there issues of language, jargon or technical knowledge that will hinder communication and understanding? Has it been a conflict situation where the different parties are sitting at the same table for the first time, or is it a multi-sector working partnership, where each party has different perspectives on successful outcomes.

Get to Know Each Other

"Walk a mile in each other's shoes," is the advice of one stakeholder engagement expert. Whether using one-on-one meetings, group interviews, focus groups, workshops, seminars, public meetings, questionnaires, web-based discussion forums or stakeholder panels, work to understand each other's viewpoints. Be as open and candid as possible in answering questions. Be willing to ask and be asked candid questions. Become as comfortable as possible with the specific individuals with whom you will be partnering. Keep in mind that partnerships are formed among organizations but succeed because of individuals.

Clarify the Agenda

A partnership between stakeholder groups should have a specific agenda, timetable, and goals—ideally, created and agreed upon by all parties. Determine what the deliverables will be, and who will deliver them. Ensure that the goals are both aggressive and manageable. Most experts say that such relationships should have a fixed duration so that projects don't drag on. Even if a stakeholder relationship succeeds it may be good to disengage for a while to gain perspective on the relationship and the value—or lack thereof—it has brought.

Agree on the Ground Rules

Find ways both parties can benefit and further their objectives, and ensure that the risks and benefits to both sides are equitable. There are a myriad of ground rules to consider. How much of the project will be publicly disclosed -- and by which parties, when, and under whose control? If there will be costs involved, who will bear them? Be careful where money is involved. Make sure it is well understood by all parties what, if anything, is expected for the money.

Get Top-Level Support

To give weight and credibility to the relationship, it should involve those high up in all the participating organizations appropriately from the onset of the relationship. This lets a partnership operate easily within the rest of the organizations and displays each organization's commitment to other partners.

²³ Business for Social Responsibility Stakeholder Engagement, www.bsr.org/CSRResources/IssueBriefDetail.cfm?DocumentID=48813#external, 15 October 2006.

Lack of top-level support can greatly undermine a partnership's chances of success.

Speak with One Voice

Designate someone as the principal contact for the project or relationship. As much as possible, flow communication with the stakeholder group(s) through that individual to avoid conflicting information and to ensure that you are communicating a consistent message.

Harness Proven Tools and Techniques

Although stakeholder engagement may appear to be outside the normal realm of daily management, it can benefit from the application of some of the business tools and resources existing within companies. Examples include professional meeting facilitation, the use of indicators and goals to measure metrics and milestones, and information management systems to compile, track, and communicate information.

Respond

It is not enough for a government to listen to its stakeholders, or use the process to legitimize decisions without the possibility of change or influence. Ask: "Are we doing this because we genuinely feel stakeholders have something to contribute or is it

because we feel we should and think it will be good for our image?" That is not to say that communities should (or could) meet all the demands of all their stakeholders.

Analyze and Report the Results

The value of stakeholder engagement will be enhanced if a community uses a variety of metrics and indicators and analyzes and reports on them during and after the relationship to determine whether and how the project met its goals. Stakeholder-related indicators typically cover such things as the specific, measurable results of the relationship, third-party facilitation, and the direct and indirect costs of managing the process. Periodic reports of the progress of the relationship are valuable to all involved. At the conclusion of the process, many communities issue a public report describing the relationship, including the process and the tangible results.

Understand the "Who, What, Where, When & How"

In summary consider the following:

Who is involved in the engagement? Engagement may focus on one or more groups. It may attempt to survey all individuals within a

group or to identify a sample that is either representative or able to provide information of particular value.

What is the subject of engagement? Engagement may focus on a particular issue, or may be linked to a particular part of an organization's decision-making process. In some cases, there may be no clearly formed subject of engagement - the point is to allow the stakeholders to understand each other better and to allow important issues to arise unforced.

Where does the engagement take place? This may be driven by the use of a particular technique, for example the use of the Internet or postal questionnaire.

When is the engagement undertaken? The engagement may be a one-off process either to begin a process of debate or to close off a decision.

How does the organization engage with stakeholders - which methodologies and techniques does it use? A variety of techniques can be used to engage with stakeholders, including workshops, telephone hotlines, etc.

Additional Resources

Clean Air-Cool Planet – Community Toolkit

Clean Air-Cool Planet, with assistance from Jeffrey H. Taylor and Associates, have created this Toolkit to assist communities in implementing sustainable policies and projects. This web-based "how-to" guide for municipal staff and elected or appointed representatives provides:

- Step-by-step project guides
- Important contacts
- Financing mechanisms
- Cost implications
- Model ordinances

The Toolkit offers projects focused on energy, transportation, waste and land use.

Federal House in Order Initiative, Government of Canada: Staff Awareness & Training

<http://www.fhio-ifppe.gc.ca/Default.asp?lang=En&n=C4F1C34D-1> Employee awareness is defined as the process of informing, training and involving your employees in any specific issue important to your organization, whether it be health and safety, waste reduction, or in the case of Federal House in Order, climate change. Employee awareness activities in the area of climate change can include, but are not limited to:

- Distributing climate change information to employees via emails, newsletters, websites or other communication mediums;

- Conducting employee awareness and orientation workshops, which include climate change topics such as the science of climate change and actions to reduce GHG emissions and improve energy efficiency;
- Establishing employee awareness teams and holding regular meetings to address climate change activities, while assessing new awareness and training opportunities within the organization, and
- Including climate change as a topic at staff meetings.

This section provides details on how to develop and implement an employee awareness program, information on existing awareness programs and employee awareness tools/resources.

Global Green USA – Local Government Green Building Initiative

<http://globalgreen.org/greenbuilding/localGov.html> Global Green USA works in partnership with local governments and other public entities to demonstrate the benefits of green building, outline options for establishing green building programs that protect local quality of life and the environment, provide training for staff and constituents, and encourage the development of incentives for green building projects. Current and past partners include San Mateo County and the Cities of San Francisco, San Jose, Los Angeles, Santa Monica, West Hollywood, Santa Clarita, and Irvine.

U.S. Environmental Protection Agency – Climate Change: State and Local Governments

<http://www.epa.gov/climatechange/wyecd/stateandlocalgov/index.html>

The website provides details on actions by states and efforts by local agencies to address climate change, along with links to relevant EPA voluntary programs that can help states and localities meet their goals. It also provides a directory of tools that can help state and local governments inventory their greenhouse gas emissions, analyze greenhouse gas reduction opportunities and quantify the energy, environmental and economic benefits of lowering greenhouse gases.

The National Center for Atmospheric Research – “Climate Change and Water Resources: A Primer for Municipal Water Providers:

<http://www.ucar.edu/communications/staffnotes/0606/water.shtml>

Water utility managers now have a primer to help them learn about how climate change may affect the resource they manage. In the new book, Kathy Miller (ISSE) and David Yates (RAL) describe the science of climate change, suggest how it might affect water resources, and offer advice on planning and adaptation. The book is one of the first to address climate change and urban water utilities together. The focus is on usable information. The book is accessible to people from the industry, and involves them directly in identifying vulnerabilities and options for adaptation.

Clearwater Information Exchange – Council Staff Education & Training

http://www.clearwater.asn.au/stormwater_infoexchange.cfm?areatopic=true&AreaID=43&TopicID=103&CategoryID=1

The Clearwater InfoExchange **Stormwater database** provides information to assist councils and industry groups in Victoria Australia to manage stormwater more sustainably. This site is designed to be interactive so that councils and other organizations can share their experiences and knowledge.

Natural Capitalism Solutions

Natural Capitalism Solutions creates innovative, practical tools and implementation strategies to enable companies, communities and countries to reduce their carbon footprint. It facilitates stakeholder engagement in such settings as NGO/ corporate disputes, community economic development and government climate mitigation programs.

NCS developed this Climate Protection Manual for Cities presenting case studies, best practices, cost/benefit analyses, legislation, technical descriptions and contacts to facilitate climate action planning and implementation. It explains in detail ICLEI's five-step process in creating Climate Action Plans. Helps its clients implement energy efficiency auditing and retrofits, high performance municipal building codes, transportation programs, investment in green energy and many other climate protection strategies.

Orton Family Foundation

database website is a resource for communities (their professional planners, public agencies, and concerned citizens) to identify tools and processes for better community design and decision making.

<http://www.smartgrowthtools.org/>
<http://www.orton.org/>

Thomas Jefferson Sustainability Council

The council is using a multi-stakeholder process to preserve and assess the regional environment. The three-year program is bringing builders, developers, environmentalists, social scientists, elected officials, teachers and many others together to explore the definition of sustainability, indicators of sustainability and the comparative risks of current and proposed development policies
http://www.smartcommunities.net.org/success/thomas_jeff_sust.html

San Francisco Sustainable City Website

The website allows citizens to engage in the sustainability planning and education process through a forum on the site. The "listserv" is for broadcasting announcements about events, workshops, forums, programs, publications, websites and other resources that are relevant to sustainability issues.
<http://www.sustainable-city.org/>



NATURAL CAPITALISM SOLUTIONS

NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548



Chapter 5: Local Action Plan Best Bets Municipal Buildings

DOCUMENT CONTENTS

Retrofit City Buildings	17
Lighting Retrofits	17
Compact Fluorescent Light Bulbs	17
T8 Fluorescent Lamps with Electronic Ballasts vs. T12 with Magnetic Ballasts	18
Room Occupancy Sensors	18
Energy Efficient Windows	18
CASE STUDIES: Retrofit City Buildings	
Portland, OR	19
Tucson, AZ	21
Fort Worth, TX	23
Visalia, CA	24
Energy Service Companies and Energy Savings Performance Contracts	24
CASE STUDY:	
New Haven, CT	25
Energy Efficiency Standards in New Construction and Renovations	26
Benefits of Green Buildings	27
Life Cycle Cost Analysis	27
CASE STUDIES: Energy Efficient Standards	
Oakland, CA	28
Salt Lake City, UT	29
Scottsdale, AZ	30
Austin, TX	32
Energy Audits in Major Municipal Buildings	32
CASE STUDIES: Energy Audits	
Boothbay Harbor, ME	33
Southlake, TX	34
Berkeley, CA	34
Additional Resources	35

Retrofit City Buildings

Buildings are responsible for 50% of greenhouse gas emissions. Reducing the amount of energy used in municipal buildings contribute significantly to a city's greenhouse gas reduction targets. It can also save an enormous amount of money. Retrofitting a building means making changes or additions to a building that has already been constructed. Energy efficiency retrofits can be performed on any existing building, including city offices, libraries, police stations, fire stations, or any other structure owned by the municipality that uses electricity or heating fuels like natural gas.

Although the up-front cost of energy efficient technologies is often higher than their conventional counterparts, the energy efficient options save money in reduced monthly electricity bills. Many efficiency measures pay back in months, and go on to save enough to pay for themselves many times over in the course of their lifetime.

Some, such as more efficient light bulbs will pay for themselves out of saved labor costs, because they last so much longer.

Energy efficiency retrofits of buildings include but are not limited to replacing old lighting with high efficiency lighting, replacing old appliances and equipment with ENERGY STAR® equivalents (www.energystar.gov), upgrading the HVAC system, adding insulation and window-shading, eliminating air leaks from doors and windows, and using automated systems like room occupancy sensors.

Lighting Retrofits

Compact Fluorescent Light Bulbs

Compact fluorescent light bulbs (CFLs) use one-quarter to one-third as much electricity as incandescent bulbs and last up to ten times as long. Replacing a 100-watt incandescent with a 32-watt CFL can result in energy savings of as much as \$30 over the bulb's life. They also produce less heat so installing

them can reduce air conditioning loads. Their superior quality light can increase worker productivity and reduce error rates.²⁴

ENERGY STAR®-qualified CFLs²⁵ provide the same amount of light as standard incandescent bulbs. CFLs also reduce the risk of burns and fires associated with the use of halogen bulbs that can reach temperatures of 1,000 degrees Fahrenheit.

T8 Fluorescent Lamps with Electronic Ballasts vs. T12 with Magnetic Ballasts

All fluorescent lamps utilize bulbs and ballasts. One can replace both parts with more energy-efficient technologies. By replacing standard magnetic ballasts and T-12 fluorescent lamps with more efficient T-8 lamps and electronic ballasts, a building can consume 40% less energy for lighting.

The standard commercial lighting with the 1.5-inch diameter (T-12) cool-white fluorescent lamps and transformer-type magnetic ballasts is quickly becoming an obsolete technology. The combination of high-efficiency 1-inch (T-8) lamps coupled with electronic ballasts can reduce total energy use for lighting

significantly. The light produced by the new systems more closely resembles natural light. The new technology also eliminates the rapid flicker and the faint buzz of traditional fluorescent lights. For each fixture of four lamps that is upgraded, the city can save about \$12 a year in energy costs.²⁶ New T-5 bulbs are even smaller and more efficient.²⁷

Room Occupancy Sensors

Occupancy sensors are automatic controls that detect when people enter and exit a room and adjust lighting, heating and cooling within the room as needed. Properly installed occupancy sensors can reduce energy costs associated with lighting and HVAC by up to 80%.²⁸ Modern sensors can self-adjust by “learning” about occupancy patterns throughout the day and warn room occupants of a pending shutdown. Override options allow room occupants to postpone sensor-triggered changes until they leave. Two types of occupancy sensors currently in the market are infrared sensors and ultrasonic sensors.

Utility Savings Initiative Fact Sheet-Occupancy Sensors allows cities to estimate the potential

cost savings from adopting occupancy sensors.²⁹

Energy Efficient Windows

According to the Department of Energy, 25% of the energy used to heat a building goes right out the windows.³⁰ The most efficient windows produced today insulate four times better than windows produced two decades ago. Multiple layers of thin plastic films suspended between the lights of glass can improve the insulation capacity of a window dramatically. Another factor is the thickness of air space locked in between the panes of glass in the windows. More air space will insulate much better than a thin air space. The insulation can be improved even more by substituting a low-conductivity gas such as argon for the air in the sealed air space.³¹ Tinted glass coatings and low-emissivity (low-e) coatings reduce the amount of solar heat that enters the building while maintaining necessary light levels. Thin-walled steel, silicone foam and butyl rubber edge seals also contribute to maintaining an airtight seal and increase the insulation of windows.

²⁴ Joe Romm, Greening the Building and the Bottom Line, Increasing Productivity Through Energy Efficient Design, www.rmi.org/store/p12details963.php, 20 December 2006.

²⁵ ENERGY STAR® web site, www.energystar.gov/index.cfm?c=cfls.pr_cfls, 22 September 2006.

²⁶ T-8 Fluorescent Lamps and Electronic Ballasts, Madison Gas and Electric website, www.mge.com/business/saving/detail/t8.htm, 19 September 2006.

²⁷ Service Lighting, www.servicelighting.com/library/light_bulbs_fluorescent_t5_lighting.cfm, 20 December 2006.

²⁸ “Low-Cost Occupancy Sensor Saves Money,” Atmel Applications Journal, www.atmel.com/dyn/resources/Prod_documents/mega88_3_04.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Bulidings/Atmel_mega88_3_04.pdf, 19 September 2006.

²⁹ Occupancy Sensors, Utilities Savings Initiative, www.p2pays.org/ref/32/31316.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/OccupancySensors_factsheet.pdf, 19 September 2006.

³⁰ Divya Abhat, “GREEN LIVING: HOUSE & HOME. Green Glass, Stylish Window Treatments Help Clear the Air,” www.emagazine.com/view/?2858, 20 December 2006.

³¹ Alpen Inc. website, www.alpeninc.com/features/hm_low_e/index.html, 20 December 2006.

Even more important than the type of glass used, is to ensure

that the cracks around the windows are properly caulked.

Most buildings have enough little cracks to amount to leaving a window open all year.

Retrofit City Building

CASE STUDY: Portland, OR

In 1991, the city of Portland created a program called the City Energy Challenge (CEC) to reduce overall energy use in its municipal facilities and operations.

During the ten years after its creation, the CEC saved the city of Portland \$9.6 million in energy costs.³²

That resulted in avoiding the emission of 115,000 tons of carbon dioxide emissions during the same decade.³³ The promotion of energy efficiency in city buildings and facilities comprises a significant part of this program. The following three examples of municipal building retrofits in Portland demonstrate that upgrades of existing city buildings can provide positive returns on investment in under a decade.

The Portland Building is one of the highlights of the CEC Project. It is a 15-story municipal office building constructed in 1982 with a total floor area of 360,000 square feet. The retrofit process began in 1992 as a three-phase project to install several different energy efficient improvements

throughout the building. During Phase I the building's lobby received a massive upgrade of its lighting system. Old lighting fixtures were replaced with CFLs. The interior walls received a new coat of lighter-colored paint. With these improvements, the lighting levels in the lobby increased dramatically while the total wattage used fell from 21.5 to 1.5 watts per square foot. Phase II of the Portland Building retrofit targeted the lighting fixtures throughout the rest of the building and employed similar technology upgrades. Phase III of the retrofit included the installation of a lighting control system that turns office lights off at a specified time. To avoid inconvenience, the system shutdown can be overridden by a room's occupants.

The total estimated investment of \$200,000 in retrofits for the Portland Building save the city taxpayers approximately \$35,000 a year in reduced energy costs.³⁴

Fire Station #1

In 1994, several fire stations in Portland received major retrofits as part of the CEC project. A

major upgrade of Fire Station #1 cost \$80,000 to implement and saves \$8,000 a year. The station's old lighting system of 300 T-12 magnetic fluorescent lights was replaced with T-8 electronic systems. Occupancy sensors were installed in many of the station's rooms. The retrofit also included a new, more efficient HVAC system.

Portland City Hall

In 1998, the CEC project turned an old, dark stuffy city hall building into a model of unique energy efficiency retrofitting. Efficient CFL light fixtures that maintained the building's historic character replaced the outdated lighting system. Walls received a new layer of insulation. New double-glazed glass windows replaced old ones that had been covered up during previous renovations. The renovation of interior atriums and their skylights that had also been hidden by previous "upgrades" provided a natural source of light throughout the building's four floors. With a total investment of \$105,000, the Portland City Hall Renovation Project saves the city an estimated \$15,000 a year.

³² CEC Ten Year Report, Office of Sustainable Development, City of Portland, 2001, www.portlandonline.com/shared/cfm/image.cfm?id=111736, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/CEC_TenYearReport.pdf, 29 September 2006.

³³ Ibid.

³⁴ E-mail from Michael Armstrong, City of Portland, June 30, 2006.

City Facility	Investment	Annual Savings	Simple Payback	Tons of CO ₂ Avoided per year	\$/ton CO ₂ avoided
Portland Building	\$200,000.00	\$35,000.00	5.7 years	291.67	- \$74.29
Fire Station #1	\$80,000.00	\$8,000.00	10 years	66.67	- \$40.00
Portland City Hall	\$105,000.00	\$15,000	7 years	125.00	- \$25.26

Table: Returns on Investment and per-ton CO₂ Reduction Costs
City of Portland Municipal Buildings³⁵

Complementing the major renovations of these and other municipal buildings is the city of Portland's policy of purchasing only ENERGY STAR® or equivalent products, when available, for any equipment that uses electricity, natural gas or fuel oil. It is estimated that each non-ENERGY STAR® personal computer that is replaced with an ENERGY STAR® equivalent accounts for nearly one ton of CO₂ avoided and \$15-\$25 of annual electricity cost savings.³⁶

Funding for CEC

The Energy Challenge receives its funding through a 1% surcharge on each municipal bureau's energy bill with an annual cap of \$15,000 from any

one agency. The \$75,000 raised covers the cost of an energy manager for the city. The City Energy Challenge saves the city an estimated \$2.3 million in expenses each year.

In addition to the in-house surcharge, the State of Oregon offers tax credits for energy and building efficiency projects.

Although the city governments of the State of Oregon do not have to pay taxes and therefore do not benefit directly from a tax credit program, these tax credits may be "passed through," or transferred from the city government to other entities. This enables city governments to trade tax credits with local businesses in exchange for

goods or services. The businesses can then use the tax credits, keeping the tax benefits within the community and cultivating competition among local businesses for the provision of energy efficient products.

Model Plans

City of Portland 1990 Energy Policy

City of Portland 2000 Energy Policy Progress Report³⁷ — *1990 Energy Policy: Impacts and Achievements*

CONTACT

Alisa Kane
Green Building Program
(503) 823-7082

³⁵ Michael Armstrong, city of Portland. City of Portland City Energy Challenge Ten-Year Report, Office of Sustainable Development.

Note: CO₂ calculations based on 15-year building lifespan, \$0.085/kWh and 0.00065 tons CO₂/kWh (from Climate Trust U.S. Marginal Grid Intensity Factors).

³⁶ Charleston Local Action Plan on Climate Change, December 2003, p. 7, www.cofc.edu/ghgas/Charleston_SC_%20LAP.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/Charleston_LAP.pdf, 29 September 2006.

³⁷ Portland Energy Impacts & Achievements Report, 2000, <http://www.caleep.com/docs/resources/policies/Portland-energyupdate2000.pdf>, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/Portland_Energy2000.pdf, 19 September 2006.

CASE STUDY: Tucson, AZ

In June 2006, the city of Tucson created the Office of Conservation and Sustainable Development. One of the new office's initiatives is the promotion of energy efficiency design principles and technologies in municipal facilities and throughout the desert community of 500,000 people.

The state of Arizona requires all buildings to meet the Model Energy Code (MEC), a set of national standards for lighting, insulation, window glazing and other energy efficiency features. The city of Tucson established its own energy efficiency standards for buildings in 1998 that are 50% higher than the MEC. The

Tucson "Sustainable Energy Standard" applies to all new construction and renovation of municipal buildings and facilities. After positive feedback on the program from contractors and builders, the city of Tucson expanded the SES. It is now a citywide voluntary standard on all construction. The process involves designers and contractors to ensure that all parties understand the benefits and potential savings of energy efficiency.

The following table highlights the retrofit of one of the city of Tucson's municipal buildings under the SES. For additional information about the

city of Tucson's energy efficiency programs, visit their web site.³⁸

The Thomas O. Price Service Center Building is a city administrative office building with one floor and 23,400 square feet. In 1995, the city of Tucson began a major energy efficiency upgrade of the building, including a lighting retrofit, installation of an energy management and control system, and the replacement of a constant volume air handling system to a variable air volume system. The following chart details the costs and returns on investment of the specific retrofits.

Project	Investment	Annual Savings	Simple Payback	Tons of CO ₂ avoided/year	\$/ton CO ₂ avoided
Lighting Retrofit	\$31,300.00	\$5,700.00	5.5 years	61.28	- \$58.96
Occupancy sensors	\$3,000.00	\$375.00	8 years	4.03	- \$43.42
Energy management & control system/variable air volume system (and others)	\$24,993.00	\$22,400.00	5.7 years	240.8	- \$57.53
New roof coating	\$24,993.00	\$4,000.00	6.25 years	43	- \$54.27
TOTAL	\$187,493.00	\$40,000	5.77 years	349.11	- \$78.77

Table: Returns on Investment and per-ton CO₂ Reduction Costs³⁹

³⁸ Tucson homepage, www.tucsonaz.gov, 19 September 2006.

³⁹ SWEEP, www.swenergy.org/casestudies/arizona/tucson_topsc.htm

Note: CO₂ calculations based on 15-year building lifespan, \$0.06/kWh and 0.000645 tons CO₂/kWh (from Climate Trust U.S. Marginal Grid Intensity Factors).

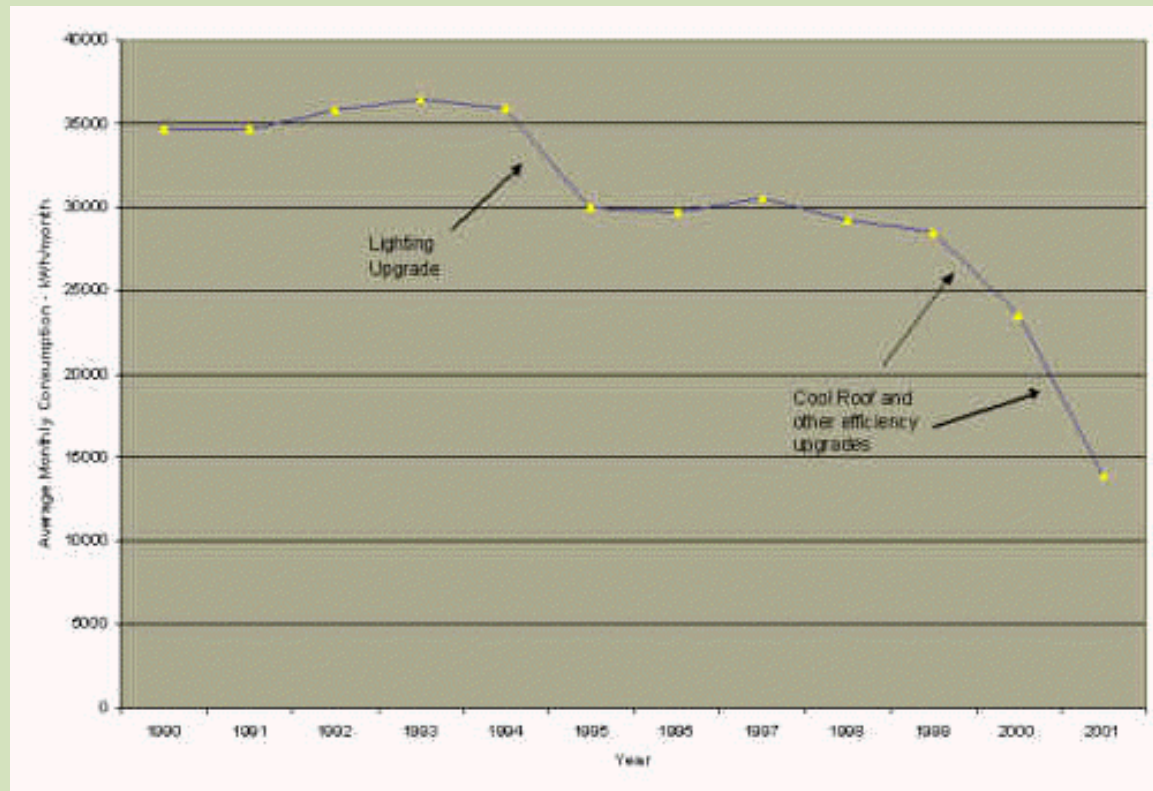


Figure : Thomas O. Price Service Center Building One,
Average Monthly Electricity Use (kWh)⁴⁰

CONTACT

Vinnie Hunt
Office of Conservation and
Sustainable Development
Vinnie.Hunt@tucsonaz.gov

⁴⁰ SWEEP, www.swenergy.org/casestudies/arizona/tucson_topsc.htm, 19 September 2006.

CASE STUDY: Fort Worth, TX

Between 2001 and 2003, the city of Fort Worth, Texas, reduced its electricity consumption by 16%. This was in part due to the passage of [Senate Bill 5 \(SB5\)](#),⁴¹ the Texas Emissions Reduction Plan, by the Texas Legislature in 2001. The new law required all city and county governments in the state to implement all cost-effective energy efficiency measures. The law requires the governments to establish a goal of 5% reductions annually in electricity use for government facilities and operations between 2002 and 2006.

The city of Fort Worth surpassed the state's efficiency benchmarks, by implementing cost-effective strategies in coordination with a private company that specializes in energy efficiency retrofit projects known as an Energy Savings Company (ESCO). In Fort Worth's case, the \$3 million performance contract offered projected savings on electricity of more than 4 million kilowatt hours a year for total electricity savings of \$259,000 a year.⁴² The city also qualified for a sizeable rebate from the local utility.

Many states have ESPC legislation, including Florida⁴³ and Wisconsin⁴⁴. There are many other resources that might be useful to a municipality exploring the use of ESCOs, including the National Association of Energy Service Companies⁴⁵ and Model Performance Contracting Legislation⁴⁶

CONTACT

Manager
Greg Simmons
Fort Worth Facilities
(817) 392-7862
greg.simmons@fortworthgov.org

⁴¹ Texas Legislature Online, <http://www.legis.state.tx.us/>, 19 September 2006.

⁴² Rebuild America State and Local Government Success Story, September 2004, [www.rebuild.org/attachments/SolutionCenter/Fort_Worth_FINAL102604\(1\).pdf](http://www.rebuild.org/attachments/SolutionCenter/Fort_Worth_FINAL102604(1).pdf), also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/Fort_Worth_rebuild.pdf, 29 September 2006.

⁴³ ESPS legislation—Florida www.flsenate.gov/statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=Ch0489/SEC145.HTM&Title=%3e2003-%3eCh0489-%3eSection%20145, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/ESPCFloridaLegislation.pdf, 19 September 2006.

⁴⁴ ESPS legislation—Wisconsin folio.legis.state.wi.us/cgi-bin/om_isapi.dll?clientID=54264357&infobase=stats.nfo&i1=energy%20savings%20performance%20contracts&jump=energy%20savings%20performance%20contracts&record={CBA4}, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/ESPCWisconsinLegislation.pdf, 19 September 2006.

⁴⁵ National Association of Energy Service Companies, www.naesco.org, 19 September 2006.

⁴⁶ Model Performance Contracting Legislation, www.naseo.org/energy_sectors/buildings/performance_contracting.htm, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/ESPCSampleLegislation.pdf, 19 September 2006.

CASE STUDY: Visalia, CA

In 2001, the city of Visalia, California⁴⁷ began work on three major projects to increase energy efficiency in their city operations.

1. Upgrading their HVAC systems
2. Replacement of the majority of building lighting
3. Installing traffic signals with LED lighting

The city hired Invensys Building Systems, a performance contracting company who

guarantees energy reduction and electricity cost savings. The company will pay the difference between the expected results and actual results if expectations are not met.

The city replaced 55 HVAC Systems with Bryant (Carrier) units in 12 of the city's buildings, costing \$241,098. The city received a \$35,000 rebate from its utility, Southern California Electric.

Based on project estimates, the net present value of the HVAC retrofit for 10 years of energy savings is \$67,015.⁴⁸

CONTACT

Engineering & Transportation
Services Manager
Britt Fussel
Visalia, CA
(559) 713-4331
bfussel@ci.visalia.ca.us

Energy Service Companies and Energy Savings Performance Contracts

Energy Service Companies (ESCOs) are private businesses that specialize in energy efficiency retrofitting projects.

City governments can contract with ESCOs to develop and implement cost-saving retrofit projects. The ESCO conducts an energy audit of the city facilities, presents an analysis of specific energy savings that can be implemented, and provides an estimated timetable for payback of costs. The ESCO finances the entire project with no upfront cost to the city. The ESCO recovers its costs and makes a profit from a percentage of the

energy savings over a period of time agreed upon with the city. These contracts, known as Energy Savings Performance Contracts (ESPCs), act as a guarantee of energy savings for cities that prefer to mitigate the risk of heavy upfront costs for energy efficiency retrofit projects. Due to the tremendous amount of cost-savings potential in most buildings, payback periods for ESCOs are usually between two and ten years. Upon completion of the ESPS, the city owns a more efficient building that costs much less to operate and has a higher value.

A report issued in 2002 by the National Association of Energy Service Companies and Lawrence Berkeley National Laboratory notes that total services provided by ESCOs annually exceeds \$1.9 billion.⁴⁹

The report estimates that lighting retrofits by ESCOs achieve a median 47% savings over the old lighting systems and combination lighting and non-lighting retrofits achieve a median savings of 23%. ESCOs are also a source of new jobs for the community.

Energy Savings Performance Contracts (ESPC) authorizations exist at both state and federal levels. Unfortunately, the federal Energy Savings Performance Contracting program was set to expire on October 31, 2006. Because federal authorization for ESPCs is not guaranteed beyond 2006, it is vital that states ensure the viability of ESCOs for years to come. Coalitions of environmental, labor, community and business leaders are lobbying state governments to provide this authorization.

⁴⁷ City of Visalia website, www.ci.visalia.ca.us/, 5 December 2006.

⁴⁸ Flex Your Power Example, www.fypower.org/pdf/CS_LG_Visalia.pdf, 5 December 2006.

⁴⁹ "New Report Documents \$2 Billion Annual Investment in Energy Efficiency by ESCOs." National Association of Energy Service Companies, 2002.

CASE STUDY: New Haven, CT

The city of New Haven, Connecticut, has saved approximately \$24.7 million since a major energy overhaul. Starting in 1994, Mayor John DeStefano, Jr. and his administration identified the rising costs and usage of energy in municipal facilities as a major risk to the city's financial well-being. They took steps to mitigate the risk with energy efficiency upgrades. According to the City's Energy Conservation Program Summary in August of 2005, New Haven paid \$14 million in energy-related costs for its city buildings and operations in 1994. In addition to more than 300 existing facilities and a citywide street lighting system, the city of New Haven had plans to upgrade its schools and build several new schools for the community.

The city formed an Energy Committee to analyze the energy situation and devise an action plan. The Committee wisely identified energy efficiency as the most cost-effective way to address the growing energy demand and costs. Even with the additional energy demand of 23 new and renovated schools, the Energy Conservation

Program has cut the city's energy cost by \$5 million per year. The city has established a goal of achieving an additional \$6.1 million per year of savings by the year 2010.

The Energy Conservation Program includes an ESPC between a private contractor and the Board of Education. Over the nine years of the lease, the schools will achieve a guaranteed \$8.8 million in cost savings with the installation of \$6.1 million in improvements. Seven years into the Performance Contract, the Board of Education has already saved \$8.35 million.⁵⁰

The Energy Committee's strategy includes monitoring energy use and managing demand. With a series of grants from Rebuild America and other state and federal grants, as well as a performance contract with United Illuminating for the installation of infrastructure, the city installed an Energy Management System to monitor energy use and control electricity in all of its facilities from a central location. The system limits energy consumption during peak hours

when electricity is much more expensive. The energy management does not adversely affect the facilities' ability to function normally.

To fund the significant investment necessary to implement the Energy Conservation Program, the city of New Haven has applied for and received \$2.5 million in state and federal grants. It has also qualified for \$955,501 in utility rebates and incentives as a result of its reduction in total energy use.

Among the many technologies the city has used to achieve such high levels of energy savings are:

Occupancy sensors

Upgrade of lighting with high-efficiency fluorescent lights

Replacement of old traffic lights with LED traffic lights

High pressure sodium street lights

Installation of high-efficiency motors and pumps

Energy monitoring systems

⁵⁰ City of New Haven Energy Conservation Program Summary, 30 August 2005, p. 7. Online: www.cityofnewhaven.com/Finance/pdfs/EnergyConserReport8-30-2005.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/NewHaven_EnergyConserReport.pdf, 21 September 2006.

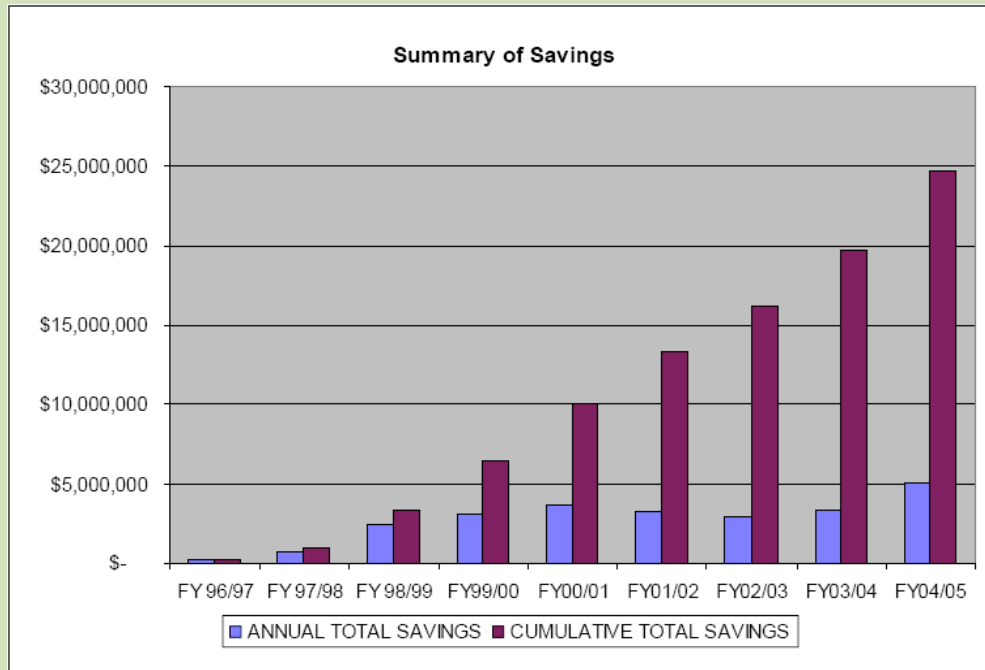


Table: City of New Haven Energy Conservation Program⁵¹

CONTACT

Mike Piscitelli
Comprehensive Planning
(203) 946-7814
mpiscite@newhavenct.net

Energy Efficiency Standards in New Construction and Renovations

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System is the most widespread set of national standards for buildings. It was developed by the U.S. Green Building Council

(USGBC) to provide consistent guidelines in the design and construction of many types of high-performance buildings, and a quality assurance program. The LEED Rating System evaluates the building as a whole system. The building can achieve a level of Certified, Silver, Gold or Platinum, based on meeting a number of different criteria with points given for each measure.

In a report written for the California Sustainable Building Task Force in 2003, several architects and construction contractors compared the actual costs of 33 green buildings with the estimated costs of the same buildings using standard designs. The results of the survey indicate that compliance with LEED Certification standards increases upfront costs by under 2% (or \$3 to \$5 per square foot). This 2%

⁵¹ Ibid.

upfront investment is estimated to produce a life-cycle savings of 20% of total construction costs.⁵² Another study by Davis Langdon Seah International suggests that cost premiums for efficiency improvements can range between 1 and 4% for LEED Silver and up to 10% for LEED Platinum certification.⁵³ Over the course of the LEED certified buildings' lives, the savings in total costs can be as much as 10 times more than the extra cost of sustainable design.⁵⁴ An investment of \$100,000 to integrate sustainable design features into a new building can therefore produce a return of \$1 million in saved costs over the building's life.

LEED Standards for Retrofits include Major Renovations⁵⁵, Sustainable Operations and Maintenance of Existing Buildings⁵⁶ and Tenant Improvements of New or Existing Office Space.⁵⁷

Benefits of Green Buildings

There are several advantages to incorporating LEED Certified designs into city buildings. By using fewer resources, the city will significantly reduce

operating costs. Several studies suggest that employees are more productive and generally more satisfied working in a building that uses more natural light.⁵⁸ Another study by the Lawrence Berkeley National Laboratory indicates that reducing indoor air pollutants through green building design could save U.S. businesses \$58 billion in avoided sick time and another \$200 billion in increased worker productivity.⁵⁹ Incorporating green building standards for new city

buildings contributes to the protection of ecosystems and biodiversity, improves the quality of the city's air and water, sends fewer tons of waste to the city's landfills and conserves the area's natural resources. Green buildings can also be a significant public relations tool, attracting the best and brightest workers to the city's offices. A recent Harvard Business Review article on green buildings concluded that the term "green building", "Suggest lower overhead costs, greater employee productivity, less absenteeism, and stronger employee attraction and retention....Green is not simply getting more respect; it is

rapidly becoming a necessity as corporations—as well as home builders, retailers, health care institutions, governments and others—push green buildings fully into the mainstream over the next five to ten years. In fact owners of standard buildings face massive obsolescence. They must act now to protect their investments. 'Building owners are starting to do reviews of their portfolios to see how green their buildings are and what they need to do to meet growing market demand.'"⁶⁰

Life Cycle Cost Analysis

The costs to operate and maintain a building usually exceed the initial cost of its construction many times over. Life cycle cost analysis is an innovative tool for project analysis that takes these long-term costs into account when comparing different design options for a new building. It factors into the equation the following sets of costs:

Initial design and construction costs

⁵² Greg Kats, "The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force", October 2003, p. viii, www.usgbc.org/Docs/News/News477.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/USGBC_News477.pdf, 19 September 2006.

⁵³ Lisa Faye Matthiesson and Peter Morris, "Costing Green: A Comprehensive Cost Database and Budgeting Methodology", July 2004, p. 16. Available online davislangdon-usa.com/Attachment%20Files/Research/costinggreen.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/CostingGreen.pdf, 19 September 2006.

⁵⁴ Kats, "The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force."

⁵⁵ U.S. Green Building Council, www.usgbc.org/DisplayPage.aspx?CMSPageID=220, 23 September 2006.

⁵⁶ U.S. Green Building Council, www.usgbc.org/DisplayPage.aspx?CMSPageID=221, 23 September 2006.

⁵⁷ U.S. Green Building Council, www.usgbc.org/DisplayPage.aspx?CMSPageID=145, 23 September 2006.

⁵⁸ Judith Heerwagen, "Do Green Buildings Enhance the Well Being of Workers?" Environmental Design and Construction Magazine, July/August 2000. Available online at www.edcmag.com/CDA/ArticleInformation/coverstory/BNPCoverStoryItem/0,4118,19794,00.html, 21 September 2006.

⁵⁹ William J. Fisk, "Health and Productivity Gains From Better Indoor Environments and Their Relationship With Energy Efficiency", Annual Review of Energy Environment, October, 2000, [https://www.usgbc.org/Docs/Resources/Fisk\(LBNL\)HealthandProductivityEE2000.pdf](https://www.usgbc.org/Docs/Resources/Fisk(LBNL)HealthandProductivityEE2000.pdf), also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/Fisk_HealthandProductivity_2000.pdf, 19 September 2006.

⁶⁰ Charles Lockwood, "Building the Green Way," *Harvard Business Review*, June 2006.

Operating costs (energy, water, wastewater, trash collection, recycling, and other utilities)
Maintenance and repair

Environmental costs/benefits (impact on air quality, water quality, natural environment)

Social costs/benefits (productivity of workers, indoor air quality, worker sickness)

Value (positive or negative) of the building after specified lifespan timeframe

The federal government evaluates energy and water conservation projects and renewable energy projects in all federal buildings using life cycle costing methodology.⁶¹

Energy Efficiency Standards

CASE STUDY: Oakland, CA

In 1998, the Oakland City Council adopted a Sustainable Development Initiative as an overriding set of principles guiding the city's economic development. The Initiative includes five action points that the Council identified as the best opportunities for implementing the ambitious plan. One of the action points is the integration of green building design in all new city-funded construction projects and major renovations. The city developed sustainable design guidelines that cover site selection and preparation, transportation to/around the location, water and energy use, indoor environmental quality, selection of building materials, and waste reduction. All projects that utilize the city of Oakland funds must meet these sustainable design standards.

City LEED Mandate

Chapter 15.35 of the city of Oakland's Municipal Code⁶² states:

To promote economic and

environmental health in Oakland, it is key that the city itself, through the design, construction, operations and deconstruction of its own facilities, provide leadership to both the private and public sectors in the arena of energy efficiency and "green" building practices. The most immediate and meaningful way to do this is to require the integration of green building strategies in as many public city buildings as feasible.

Therefore, the purpose of these provisions is to prescribe green building requirements to covered city building projects and traditional public works projects.

The city of Oakland requires that all new buildings that cost more than \$3 million and all major renovations to existing buildings that cost more than \$3 million achieve LEED Silver certification or better. The law also stipulates that a LEED-accredited professional must be on the

principal design team. The Oakland Sustainable Design Guide⁶³ is a tool that informs designers, builders, operations staff and occupants about the process of integrating green design into new and renovated city facilities. The Design Guide builds off of other green building rating systems, including LEED, Green Building Challenge '98, and BREEAM, but is uniquely tailored to fit the needs and priorities of the city of Oakland.

The Design Guide provides green building strategies that are organized according to seven environmental design topics, listed:

1. Site Strategies
2. Water Strategies
3. Energy Strategies
4. Interior Environmental Quality Strategies
5. Material Strategies
6. Waste Strategies
7. Transportation Strategies

Each of the strategies has performance indicators that must reach certain standards to obtain a specified number of points.

⁶¹ Life Cycle Costing Manual is a guide to understand the LCC methodology established by the Federal Energy Management Program, www.bfrl.nist.gov/ocae/publications/handbooks/135.pdf, also archived at, [www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/LCCA Guide_FEMP.pdf](http://www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/LCCA%20Guide_FEMP.pdf), 27 September 2006.

⁶² Full provisions of Chapter 15.35 available at www.bpcnet.com/cgi-bin/hilite.pl/codes/oakland/ DATA/TITLE15/Chapter_15_35_GREEN_BUILDING_R.html, also archived, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/Oakland_Chpt15.35.pdf, 30 October 2006.

⁶³ Oakland Sustainable Design Guide, www.oaklandpw.com/page46.aspx, 19 September 2006.

There are a total of one hundred points that are distributed among the strategies according to the perceived environmental and human impacts and can be weighted to reflect the city's priorities. The scoring system can also be changed to account for specific opportunities and constraints of the project.

The Oakland Sustainable Design Guide is flexible enough to allow it to grow and change with the development of new technologies and new city priorities. It is a process-oriented guide that is easy to follow and addresses the

entire life cycle of the buildings. The Guide makes it easy for everyone involved in the design, construction and use of new and renovated city buildings to incorporate the principles of sustainable design and meet the requirements that the city has established.

To promote the principles of the Sustainable Design Guide among local businesses and residents, Oakland created a Green Buildings Resource Center in February 2000. The Center

offers a variety of resources on site design, building products, energy/water efficiency, and solid waste management.

The city of Oakland also offers monthly lunch training sessions for city staff in green building & purchasing strategies.

CONTACT

Ferial Mosley
Public Works Agency
Environmental Services Division
(510) 238-7433
fmosley@oaklandnet.com

Energy Efficiency Standards

CASE STUDY: Salt Lake City, UT

Salt Lake City Mayor Rocky Anderson issued an Executive Order in 2005 mandating that all new municipal buildings and major renovations meet at least LEED Silver certification.⁶⁴ Salt Lake City has been a strong leader with the implementation of its Climate Action Plan.⁶⁵ By 2005 Salt Lake City has reduced the carbon emissions in its municipal operations to 21% below its 2001 baseline level. The recently-inaugurated Intermodal Transportation Hub building is LEED "certified."

The Executive Order signed by Mayor Anderson mandates:

It is the requirement of this Executive Order that, in order to obtain the benefit of reduced operating and maintenance costs and other

building efficiencies, as well as cost-saving healthy environmental practices, the City will endeavor to apply the LEED guidelines to City construction to the extent practicable, and will design and construct facilities that will qualify for a LEED rating of at least a "Silver" level. Because LEED certification can provide significant savings beyond any initial incremental construction cost increase, the City finds that endeavoring to achieve LEED certification is in the best interest of the City

Since Executive Orders are only enforceable while the mayor that signed it is still in office, the Salt Lake City Council plans to pass a permanent version of this legislation.

The Salt Lake City High Performance Building Task Force is responsible for the implementation of LEED standards in the design and construction of new city buildings and in major renovations. There is also a significant effort to promote the construction of high performance buildings in the private sector.

By making this commitment to high performance buildings, we will set an example for other environmentally-minded businesses, and we will help stimulate the market for sustainable building technologies... We will also explore all of our options in terms of creating incentives for businesses to implement these principles. We allocate millions of dollars each year to

⁶⁴ Executive Order: www.slccgreen.com/pdfs/execorderLEED.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/LEED_ExecutiveOrder_SLC.pdf, 21 September 2006.

⁶⁵ Salt Lake City Climate Action Plan, www.slccgreen.com/pages/actionplan.htm, 19 September 2006.

non-governmental projects through our Redevelopment Agency and Community Development Block Grants—all of which are opportunities to encourage high performance building.

-- Rocky Anderson,
Mayor of Salt Lake City⁶⁶

Results of Salt Lake City High Performance Building Standard

Intermodal Hub: When it reaches full capacity in 2008, the hub will serve as a transportation nerve center, complete with an Amtrak station, Greyhound bus depot, Utah Transit Authority bus transfer station, TRAX light rail station, commuter rail station, taxi cab stands and added

amenities for bicyclists. The additional charge for building the Intermodal Hub to the LEED “certified” standard was approximately 2% of the total budget. With the LEED design saving a projected 20-25% per year in energy costs, it is estimated to payback the additional construction costs in less than 10 years.

Salt Lake City Main Library⁶⁷: The new main library in Salt Lake City opened in 2003 and cost \$65 million to construct, and although it has not received official LEED certification it incorporates many LEED elements in its design, including a five-story

glass wall facing the expansive Wasatch range and a large park area outside and around the building.

The Sorenson Unity Center: Planned for Salt Lake City’s Burgeoning west side, the Sorenson Unity Center is planned and budgeted for LEED certification. This will be the second LEED certified building constructed by Salt Lake City.

CONTACT

Environmental Advisor to the Mayor
Jordan Gates
(801) 535-7939
Jordan.Gates@slcgov.com

Energy Efficiency Standards

CASE STUDY: Scottsdale, AZ

On March 22, 2005, the city of Scottsdale became the first U.S. city to adopt a LEED Gold standard for all new and renovated city buildings. The new Scottsdale Senior Center, completed in 2006, is the city’s first LEED Gold building.

In 1998, Scottsdale established Arizona’s first Green Building Program. The residential home program is a voluntary, consumer-driven effort to encourage environmentally responsible building in the fragile

ecosystem of the Sonoran Desert. The Green Building Program offers incentives to designers and construction companies that participate. Since 1998, the city has issued 932 green building permits. In 2005, 33% of all single-family residential homes achieved Scottsdale’s Green Building Program standards. The program’s consumer base is rapidly expanding, with an increase of 189% in green housing starts between 2004 and 2005.⁶⁸ A recent survey

(conducted by the National Association of Home Builders NAHB) Research Center found that 46% of consumers expecting to buy a newly built home or spend more than \$10,000 on renovations wanted to incorporate green features into their homes and did not consider the cost of green building features an obstacle.

The city of Scottsdale’s Resolution No. 6644⁶⁹ requires all new city buildings of any size to be designed, contracted and

⁶⁶ Salt Lake City Press Release from 10 October 2006, www.slcgov.com/mayor/pressreleases/hp%20buildings.htm, 19 September 2006.

⁶⁷ Link to Mayor Anderson’s comments on Library Inauguration, archived at www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/MayorAnderson_SLCMainLibrary_2003.pdf, 21 September 2006.

⁶⁸ City of Scottsdale Green Building Program website, “One Out of Three Scottsdale Homes are Going Green”, www.scottsdaleaz.gov/news/2006/January/01-12-06.asp, 19 September 2006.

⁶⁹ Resolution No. 6644: www.ci.scottsdale.az.us/greenbuilding/LEED/LEED_ResNo6644.pdf, also archived at www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/Scottsdale_LEED_ResNo664419.pdf, 19 September 2006.

built to achieve LEED Gold certification. In addition, all future renovations and non-occupied city buildings must be designed, contracted and built to include as many principles of both the LEED program and the city's Green Building Program as possible. The city of Seattle is the only other US city to implement LEED Gold standards for municipal construction.

For all city of Scottsdale construction projects that have an expected simple payback of more than five years, city staff must analyze which level of LEED certification is most appropriate for that specific project and make recommendations to the City Council. This clause allows the Scottsdale City Council to maintain control over the costs of municipal construction projects. Scottsdale city staff work closely with local designers and contractors in the development of city construction projects, a relationship that stems from the strength of the Scottsdale Green Building Program.

The Scottsdale Green Building Program provides resources and incentives to both consumers and construction companies for the promotion of green buildings throughout the city. Resources available to local designers and construction contractors include a lecture series, workshops, special events and green design manuals. The educational programs provide information on

energy/resource efficiency and feature experts in all areas of environmental design and construction. Green homeowners receive a "homeowner's manual" that explains the different features of their new home.

The Green Building Program⁷⁰ rates building projects in the following six environmental impact areas:

1. Site use
2. Energy
3. Indoor air quality
4. Building materials
5. Solid waste
6. Water

A green building point rating system is used to evaluate the projects. There are over 150 green building options, providing greater design flexibility while maintaining a whole building systems approach. The Green Building Program is voluntary and open to all builders in the Scottsdale area.

Builders that participate in the program are required to attend the educational programs the city offers. They must also take part in the annual events like the Green Building Expo. As a reward for their participation, builders qualify for expedited permitting and other assistance from the city, positive media exposure via construction site signs and recognition on the city's website, and a listing in the Green Building directory.

Results⁷¹

The new Scottsdale Senior Home⁷² is 37,600 square feet and cost nearly \$12 million to construct. It is the city of Scottsdale's first LEED Gold municipal building. The city estimates that the building's green features added about 2% to the total price tag and will use roughly half the power of a conventional building. The Senior Home design incorporates an array of solar panels that produce 30% of the building's electricity.

The building's location was planned in order to maximize natural light and shading. Other energy saving features include an extremely efficient heating and cooling system and a superinsulated roof. The Scottsdale Senior Home has an expected simple payback of less than five years.

The ASU Scottsdale Center for New Technology and Innovation is currently under construction and will be the largest commercial project in Scottsdale with LEED certification. The city hopes the center's green features will attract tenants and businesses that provide technology-related services.

Other city projects in the pipeline include:

Arabia Library (LEED Silver)

Police Forensic Lab

⁷⁰ For more information on Scottsdale's Green Building program visit -www.ScottsdaleAZ.gov/greenbuilding, 19 September 2006.

⁷¹ Scottsdale Green Building Program Progress Report 2005, www.scottsdaleaz.gov/greenbuilding/Reports/0106ProgressRpt.pdf, also archived at www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/ScottsdaleGrnBuildingReport_2005.pdf, 21 September 2006.

⁷² Senior Center Green Features, www.ci.scottsdale.az.us/smittyv/pdf/SrCtrGreen.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/SrCtrGreen_2006.pdf, 21 September 2006.

Police District Station 1

Fire Station No. 2

Westworld Exhibit Hall

**Scottsdale Center for the
Performing Arts Interior
Remodel (LEED Silver)**

CONTACT

Director
Anthony Floyd
Green Building Program
(480) 312-7990
afloyd@scottsdaleaz.gov

Energy Efficiency Standards

CASE STUDY: Austin, TX

The city of Austin has long been recognized as the leader in municipal Green Building programs. Austin's Green Building Program was created in 1991 and is administered by the city's municipal energy utility, Austin Energy⁷³. It won an award for Local Government Initiatives

at the United Nations Earth Summit in Rio de Janeiro.

In addition to several programs for private homes, commercial buildings and multi-family complexes, the city of Austin requires all new city-funded projects to attain LEED Silver certification.

Their user-friendly website⁷⁴ contains detailed information on the city's program and has links to many case studies and resources.

CONTACT

Green Building Program
(512) 482-5300

Energy Audits in Major Municipal Buildings

Energy audits are the first step in retrofitting municipal buildings. By conducting an audit, cities become aware of the areas needing improvement. Most cities first evaluate buildings based on their financial accounting system. Financial systems can show inefficiencies through increased energy consumption and cost in their

buildings. The next step is to conduct an energy audit and then update existing buildings to make them more energy efficient. Other cities need conduct an audit to determine how to allocate budget for future municipal building improvements.

The New Jersey Department of Environmental Protection explains in their Energy Audit Guide⁷⁵ the three types of audits. Each is described in order of increasing degree of detail.

The type of audit used is discussed at the preliminary consultation stage.

1. Walk-through Audit.
This is the least expensive. It involves an examination of the building or facility, including a visual inspection of each of the associated systems. Historic energy usage data are reviewed to analyze patterns of energy use and compare them with sector/industry averages or benchmarks for similar

⁷³ www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/index.htm, 19 September 2006.

⁷⁴ Austin's main web site: www.ci.austin.tx.us/, 19 September 2006.

⁷⁵ New Jersey Department of Environmental Protection "How to Conduct an Energy Audit: A Short Guide for Local Governments and Communities" www.njcleanenergy.com/media/Energy_Audit_Guide.pdf#search=%22Municipal%20Buildings%20Energy%20Audit%22, 19 September 2006. This resource explains the audit process, types of audits and the steps required to conduct an audit for local governments, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/Energy_Audit_Guide.pdf, 19 September 2006.

structures. The walk-through audit provides an initial estimate of potential savings and generates a menu of inexpensive savings options usually involving incremental improvements in O&M. Information from this level of audit also serves as a basis for determining if a more comprehensive audit will be needed.

2. Standard Audit.

This involves a more comprehensive and highly detailed evaluation. Facilities, equipment, operational systems and conditions are assessed thoroughly and on-site measurements and testing are conducted to arrive at a

careful quantification of energy use, including losses. The energy efficiencies of the various systems are determined using accepted energy engineering computational techniques. Technical changes and improvements in each of the systems are analyzed to determine the corresponding potential energy and cost savings. In addition, the standard audit will include an economic analysis of the proposed technological improvements and ECM.

3. Computer Simulation.

The computer simulation approach is the most expensive and often is recommended for more

complicated systems, structures or facilities. This involves using computer simulation software for prediction purposes (i.e., performance of buildings and systems) and consideration of effects of external factors (e.g., changes in weather and other conditions). With the computer simulation audit, a baseline related to a facility's actual energy use is established, against which effects of system improvements are compared. This audit often is used for assessing energy performance of new buildings based on different design configurations and equipment packages.

Energy Audits

CASE STUDY: Boothbay Harbor, ME

In 2005, Boothbay Harbor Town Manager, Carlo Pilgrim, decided to have an energy audit done on the municipal building after the electric bills were consistently high. The audit revealed that in 2004 of the total \$12,247 electric costs, 73% or \$8,999 was spent on electricity and 27% or \$3,248 was spent on fuel oil. Of these numbers the audit suggested around 50% of electricity used was from the lighting. Various suggestions were made for do-it-yourself measures. These were the suggested changes for lighting:

Repaint or clean reflective surfaces

Reset exterior lighting schedule

Relamp incandescent to compact fluorescent Service Technician:

Install occupancy sensors in bathrooms

Install photoelectric cells

Install additional switching

Relamp outside lights to high pressure sodium

These lighting changes alone were estimated to save the town

14,304 kilowatt-hours of electricity per year at a savings of \$1,559.18. Boothbay Harbor requested bids on an electrical update of the municipal building based on Mayhews recommendations in the January 20 and 27 issues of the Register. As of January 28, the town had not received any bids on the project.⁷⁶

CONTACT

Town Manager
Carlo Pilgrim
Code Enforcement
Office/Maintenance Repairs
Dabney Lewis
(207) 633-7714

⁷⁶ Boothbay Register, boothbayregister.maine.com/2005-02-03/municipal_makeover.html, 19 September 2006.

Energy Audits

CASE STUDY: Southlake, TX

The city of Southlake put in place a comprehensive energy policy in 2002. Part of this plan called for periodic energy audits.

The city shall periodically schedule energy audits of city facilities and current overall energy consumption. The data from these audits shall be used for the purposes of

energy conservation planning, budget development, and serving as a basis for designated operational reviews to identify methods to increase energy conservation. Recommendations from energy audits will be evaluated based on the criterion of cost effectiveness and upon the impact on service delivery to city residents.⁷⁷

Having this clearly stated in the energy policy is a clear reminder to inspectors to take energy issues into consideration for all audits and building modifications.

CONTACT

Building Inspections
(817) 748-8218

Energy Audits

CASE STUDY: Berkeley, CA

Berkeley is continually auditing their residential, commercial and municipal buildings to maintain records about potential upgrades and retrofits. Audits are typically performed when a new technology is discovered that could improve specific facility operations, when billing information reveals increases in energy consumption per square foot and cost, and for general follow up to maintain records. Berkeley's Energy Office conducted approximately 2,000 energy audits in 2003 in the residential, commercial, industrial and local governmental sector. The following breaks down audits done in each sector⁷⁸.

Residential

500/yr. Residential Energy

Conservation Ordinance (RECO) audits

300/yr. CA Youth Energy Services audits

130/yr. Weatherization audits

Commercial

Berkeley has set a target of 1,500 commercial audits by 2003 (over 1.5 years) as part of its Smart Lights program.

One thousand of these audits will include lighting improvements.

70% of these audits will occur in Berkeley, thirty will occur in neighboring cities.

Industrial

32 industrial audits/yr. as part of Climate Wise (a national program designed to reduce greenhouse gas emissions through resource conservation and efficiency).

Municipal

5 municipal audits/year.

CONTACT

Energy Officer
Neal Desnoo
Office of Energy and Sustainable Development
(510) 981-5434

⁷⁷ Southlake Policies and Procedures, www.seco.cpa.state.tx.us/zzz_sb5-tep/sb5southlake.pdf#search=%22city%20municipal%20energy%20audits%22, 19 September 2006.

⁷⁸ Sustainability Community Inventory, Energy (2003) www.ci.berkeley.ca.us/sustainable/community/08_Energy.pdf#search=%22city%20municipal%20energy%20audits%20policies%22, also archived at: www.climatemanual.org/Cities/Chapter5/BestBets/Buildings/Berkeley_Energy.pdf, 19 September 2006.

Additional Resources

The U.S. Green Building Council

www.usgbc.org

The State of Minnesota Sustainable Building Guidelines

www.moea.state.mn.us/greenbuilding/cost.cfm

Green Building Professionals Directory

www.greenbuilder.com

Oikos Green Building Source

oikos.com/

Build It Green promotes healthy, energy and resource-efficient buildings in California

www.builditgreen.org/

Green Building Resource Guide

www.greenguide.com/

California Green Building Design and Construction

www.ciwmb.ca.gov/GreenBuilding/

BuildingGreen.com publishes

[*Green Building Products*](#), a residential green product directory, and [*Environmental Building News*](#), a highly respected monthly newsletter.

www.buildinggreen.com/

The ENERGY STAR® Challenge

www.energystar.gov/ia/business/leaders/Summary_of_States3.pdf

Green Schools Resources

www.nesea.org/buildings/greenschoolsresources.html

Additional Links and Resources

www.greenbuildingpages.com/links/weblinks_gov.html

Minnesota Sustainable Design Guide

www.develop.csbr.umn.edu/msdg2/MSDG/overview.html

“Implement”- Seattle’s Sustainable Building Tool

www2.ci.seattle.wa.us/Implement/

U.S. Department of Energy Building Energy Codes Program

is an information resource on national model energy codes. They work with other government agencies, state and local jurisdictions, national code organizations, and industry to promote stronger building energy codes and help states adopt, implement, and enforce those codes

www.energycodes.gov/

Flex Your Power is a resource for energy efficiency and conservation information

www.fypower.org/

G/Rated is Portland’s gateway to green building innovation, offering initial consultation and resources specific to your green building project. Under the direction of Commissioner-in-charge Dan Saltzman, G/Rated is accelerating the adoption of cost effective green building practices as the standard of development in Portland.

www.green-rated.org

Seattle’s Sustainable Building Program

www.seattle.gov/light/conserve/sustainability/

Austin, TX Sustainable

Building Sourcebook contains information relevant to the Austin area, such as regulatory issues, climate, installation guidelines, and sources of assistance. The Sourcebook also provides pertinent information on various aspects of sustainable building strategies and possible implementation issues that may be found in less familiar approaches to building.

www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/Sourcebook/index.htm

For more resources, check the footnotes of this document.



**NATURAL
CAPITALISM
SOLUTIONS**

NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548



Chapter 5: Local Action Plan Best Bets Infrastructure

DOCUMENT CONTENTS

Light-Emitting Diode (LED) Traffic Signals and Traffic Flow Management Systems	36
CASE STUDIES: LED Traffic Signals	
Sacramento, CA	37
Chicago, IL	38
Berkeley, CA.....	39
Traffic Flow Management Systems	39
CASE STUDY: Traffic Flow Management	
Colorado Springs, CO	40
High Efficiency Street Lighting	40
High Pressure Sodium Lamps..	40
Low Pressure Sodium Lamps..	40
Metal Halide Lamps.....	41
Induction Lighting	41
Lamp and Light Fixtures	42
Remote Streetlight Control	42
CASE STUDIES: High Efficiency Street Lighting	42
Medford, MA	42
Flagstaff, AZ	43
San Diego, CA.....	43
Increase Efficiency of Municipal Water and Wastewater Utilities	44
CASE STUDIES: Water and Wastewater Efficiency	
Columbus, GA	45
Fairfield, OH	45
Austin, TX.....	46
San Diego, CA.....	47
Landfill Gas-to-Energy Projects	48
CASE STUDIES: Landfill Gas-to-Energy Projects	
Los Angeles, CA.....	50
Riverview, MI	51
Orange County, FL.....	52
Additional Resources	53

Light-Emitting Diode (LED) Traffic Signals

Many cities have begun replacing their old incandescent halogen bulb traffic lights with much more energy efficient and durable light-emitting diode (LED) traffic lights. LED arrays in the new traffic lights include hundreds of individual LEDs each the size of a pencil eraser. There are three principle advantages to upgrading municipal traffic lights to LEDs:

1. LEDs are brighter. LED traffic lights emit light more evenly, making them brighter overall and more visible in foggy conditions.
2. LED traffic lights last for 100,000 hours, compared to incandescent bulbs, which have filaments that burn out and may last only 8,000 hours before needing to be replaced.



Replacing bulbs costs money for materials and labor and the replacement inhibits traffic flow. Fewer burned-out lights increases safety of intersections.

3. LEDs consume less energy, about 85% less than incandescent bulbs.

Typical incandescent traffic lights use 100-watt or 150-watt bulbs that are operating 24 hours a day, utilizing more than 2.4 kilowatt-hours per day. At 8 cents per kilowatt-hour, one intersection can cost almost \$600 per year in electricity. Large cities with thousands of intersections spend millions of dollars on electricity just for traffic lights. LED arrays consume 12-20 watts instead of 100, reducing overall energy consumption considerably. Portland spent \$2.1 million to change out red and green traffic lights to LEDs and received a 4-year payback on the project.⁷⁹ Solar panels can power LED traffic lights in remote areas, reducing the costs of installing power lines.

⁷⁹ Personal communication with David Tooze, Portland's Energy Specialist.

Another benefit of LED traffic signals is the fact that they do not burn out all at once. When an incandescent filament burns out, the entire light ceases to function.

In an LED, a single diode or a cluster of diodes can stop working or burn out, but the other diodes operating independently will continue to

function normally. This feature eliminates the safety risks and traffic congestion problems of burnt-out traffic signals.

LED Traffic Signals

CASE STUDY: Sacramento, CA

Between 1994 and 2004, the city of Sacramento upgraded the traffic lights in more than 1,000 of its 1,300 intersections. The decade-long conversion from incandescent lamps to LEDs has reduced the energy consumption by the Sacramento Municipal Utility District (SMUD) by a total of 1.4 megawatts. When all the intersections are completed, the estimated energy savings will be an estimated 2 megawatts.

Despite initial skepticism concerning the value of upgrading to LEDs given the higher upfront costs, the SMUD invested in the conversion of its first major intersection in April of 1995. The city's 30-day electric bill for that intersection dropped from \$148 to \$21.40.⁸⁰ Current overall savings of the traffic light upgrades across Sacramento

County are an estimated \$557,000 a year.

Additional financial incentives provided by the SMUD include rebates of about \$225 for each on-peak kilowatt that the city and county reduce.

A policy encouraging the upgrade of traffic lights to LEDs by the California Energy Commission (CEC) has resulted in the conversion of over 13,000 intersections throughout the state. The stated goals of the policy are to assist local government agencies in saving money, conserving energy to avoid crises like the blackouts of 2001 and increasing the overall safety of intersections. The CEC offers loans and grants to local agencies for the implementation of LED upgrades.

Results of the CEC incentive program include the replacement of nearly 250,000 old incandescent red, green and amber traffic signals, along with pedestrian walk and do not walk signals, with new LED lamps. The new LED lights reduce the State's need for electricity by nearly 10 megawatts, enough electricity to power nearly 10,000 homes.

The reduced electricity demand should save the state an estimated \$7.9 million every year on electricity costs.

CONTACT

Interim Director
Fran Halbakken
Department of Transportation,
city of Sacramento
mhanneman@gw.cityofsacramento.org

⁸⁰ SMUD, LED Traffic Signals, www.smud.org/education/led.html, 22 September 2006.

CASE STUDY: Chicago, IL

The city of Chicago has an estimated 2,800 intersections. Through a joint venture between the Chicago Department of Transportation (CDOT) and the City's Bureau of Electricity, old traffic lights at 350 intersections have been replaced with LED traffic signals. According to Matt Smith, Director of Communications at CDOT, the new LED traffic signals have demonstrated their efficiency through significantly reduced energy costs.⁸¹ The city estimates that it will save \$2.5 million annually by retrofitting all of its intersections. The program has already reduced the city's annual CO₂ emissions by 7,250 tons.

An added benefit of switching to LEDs is the ability to use backup power supply for traffic signals during power outages. In conjunction with the LED retrofit program, the city of Chicago has installed PowerBack ITS Systems at approximately 800 new and existing traffic intersections. The PowerBack ITS System is a complete battery

backup system for traffic signal intersections that keeps traffic signals on when the power goes out. The PowerBack ITS Series will operate traffic signals after a power outage in either normal or "flash" mode for up to 24 hours. Although such backup power supplies can be used in traditional incandescent traffic signal systems, they provide a much longer range of emergency coverage with more energy efficient LEDs.

CDOT has also begun implementing the use of activated or actuated traffic signals that can detect when a vehicle is in the intersection. This network of vehicle detectors automatically detects traffic movement and patterns and allows automated adjustments of the traffic signal operation to streamline the flow of traffic. Stop-and-go traffic wastes energy since gasoline-powered cars use almost as much energy idling as driving. Timing traffic lights, particularly during commuting hours in the commuting direction, will alleviate

congestion and excessive stop-and-go traffic. The results of CDOT's integrated traffic management program are a better understanding of traffic patterns, better coordinated traffic signals at any particular intersection, increased efficiency of traffic flow, and fewer accidents.

Mayor Daley's Traffic Management Task Force meets regularly to review major construction projects and special events that are likely to have significant impact on the city's traffic. Members of CDOT, the Mayor's Office, and other key city departments and agencies work with media outlets to design solutions and inform the public on road closures, alternate routes and traffic advisories.

CONTACT

Director of Communications
Matt Smith
Chicago Department of Transportation
(312) 744-7261.

⁸¹ U.S. Mayors Best Practices Database, www.usmayors.org/uscm/best_practices/traffic/best_traffic_initiative_chicago.htm, 22 September 2006.

CASE STUDY: Berkeley, CA

The city of Berkeley received more than \$225,000 in rebates from the utility, Pacific Gas & Electric (PG&E), for replacing nearly 3,000 traffic signal bulbs with energy-efficient LED fixtures.⁸² The city replaced old red and green traffic incandescent bulbs over several years as part of an energy conservation program sponsored by PG&E. Amber bulbs, since they are used so infrequently, are seldom replaced and are usually the last priority for replacement in municipal retrofit projects.

According to the city of Berkeley's Climate Action Plan⁸³, the retrofit costs for LED traffic signals are as follows:

8" diameter red lights	\$170 each
12" diameter red lights	\$240 each
Pedestrian control lights	\$160 each

LED technology has experienced significant growth in recent years and these prices will likely continue to decrease with time.

The city of Berkeley estimated that it will reduce its energy use for traffic signals by more than 563,000 kWh, which is roughly equivalent to \$56,000 per year of reduced energy costs.⁸⁴ According to Neal DeSnoo, energy officer for the Office of Energy and Sustainable Development for the city of Berkeley, actual energy savings from 1998 to 2005 were 890,000 kWh for all the signals and exceeds the original estimate of 563,000 kWh. Meter measured energy savings has been reduced from 1,341 kWh in 1998 to 451 kWh in 2005—approximately 66% in savings. Additional savings in reduced maintenance costs increase the payback rate of the upgrade investment. The amount of

electricity saved also equates to the reduction of 323 metric tons of CO₂.

Following The California Energy Commission's (CEC) recommendation that cities optimize their traffic signals every three to five years, the city of Berkeley integrates signal coordination and traffic flow management into its transportation plan. According to the CEC, cities participating in CalTran's Fuel Efficient Traffic Signal Management (FETSIM) program reduced gasoline use by 19%. As an added benefit, travel time was also reduced by an average of 7.5%.

CONTACT

City of Berkeley Energy Officer
Neal DeSnoo
Office of Energy and Sustainable Development
(510) 981-5434

Traffic Flow Management Systems

Traffic flow management consists of set light timing, activated traffic signals, signal

synchronization and more techniques that work to improve traffic flow. With these programs commuters should experience a reduction in travel time, less gas consumption and cost savings due to the coordination of signals. These

strategies reduce air pollution and GHG emissions caused by idling.

⁸² Berkeley Press Release, January 2003, www.ci.berkeley.ca.us/news/2003/01/jan/011403energyrebate.html, 22 September 2006.

⁸³ Berkeley Climate Action Plan, www.baaqmd.gov/pln/GlobalWarming/BerkeleyClimateActionPlan.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/Berkeley_CAP.pdf, 29 September 2006.

⁸⁴ Ibid.

CASE STUDY: Colorado Springs, CO

The city of Colorado Springs, Colorado traffic signal timing team studies 30-40 arterial streets each year to determine optimal traffic flow coordination.⁸⁵ In 2005, the city released the Traffic Signal Coordination Planning Effort Report that describes the potential upgrades and new technologies the city could adapt to minimize traffic.⁸⁶

In the report the city recognizes the potential time and cost saving benefits traffic flow management

can have. "Each dollar spent optimizing signal timing and implementing system improvements can yield up to \$40 in fuel savings." "As national studies indicate, coordinating previously uncoordinated signals can result in a reduction in travel time ranging from 10% to 20%. According to our own recent studies conducted along Academy in February, there is a 10% to 30% improvement in travel times resulting from coordinated signals."

The key systems Colorado Springs uses to coordinate their traffic flow include:

- Communications Links to Signals
- Traffic Signal Controller Equipment
- Advanced Traffic Detection System

CONTACT

Traffic Signal Timing Team
(719) 385-5966
Trafficeng@springsgov.com

High Efficiency Street Lighting

According to a review conducted by the California Energy Commission, street lighting accounts for as much as a quarter of a municipality's electric bill.⁸⁷ The choice of what kind of street lighting to use affects the city budget as much as it influences the city's ambience. New technologies in lighting provide more efficient ways to effectively illuminate neighborhoods and public spaces. The quality and brightness of street lighting does

not need to be compromised in order to significantly reduce the amount of electricity consumed.

High Pressure Sodium Lamps

High pressure sodium lamps (HPS) are a very popular option for municipal street light systems across the country. HPS lighting is 57% more efficient than incandescent street lamps and 32% more efficient than mercury vapor lamps. HPS lamps produce 90-150 lumens per watt⁸⁸ (compared to 30-48 lumens per watt in mercury vapor lamps).⁸⁹ HPS street

lighting systems have a payback period of about six years compared to mercury vapor lamps.⁹⁰ However, the orange-yellow light produced by HPS lamps does not contain light in the blue spectrum, diminishing people's ability to use peripheral vision at night. It also does not render colors as well as other lamp types.

Low Pressure Sodium Lamps

Low pressure sodium lamps (LPS) are even more energy efficient than HPS lamps. They were designed to operate at low

⁸⁵ Colorado Springs, Traffic Flow Coordination website, www.springsgov.com/Page.asp?NavID=2482, 5 December 2006.

⁸⁶ Traffic Signal Coordination Planning Effort, www.springsgov.com/units/traffic/SignalCoordinationPlan.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/ColoradoSprings_SignalCoordinationPlan.pdf, 5 December 2006.

⁸⁷ Currents: An Energy Newsletter for Local Governments, www.lgc.org/freepub/PDF/Energy/currents/09_streetlighting99.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/LGC_newsletter.pdf, 29 September 2006.

⁸⁸ Ibid.

⁸⁹ City of Los Angeles, Environmental Affairs Office. 2001. Los Angeles Energy Climate Action Plan is under revision in October 2006. Also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/LAClimateActionPlan.pdf, 25 September 2006.

⁹⁰ Currents: An Energy Newsletter for Local Governments, www.lgc.org/freepub/PDF/Energy/currents/09_streetlighting99.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/LGC_newsletter.pdf, 29 September 2006.

temperatures and maintain luminance throughout the lamps' lifetime. The light produced by LPS lamps is a dull yellow color, does not allow for effective peripheral vision, and does not render colors well. It is the lighting of choice around observatories since the monochromatic light can be filtered by telescopes. LPS color limitations make it difficult to use. Therefore, the intensity of sodium lamp lighting levels may need to be adjusted to perform as well as lower wattage, wider spectrum white lighting.

Metal Halide Lamps

Metal halide lamps use an electric current that passes through a gas to create light. The bright white light is very effective for rendering colors at night and does not adversely affect peripheral vision. Metal halide lamps produce large amounts of heat and can burn out quickly. The brightness of the lamps also creates a high potential for glare. Metal halide lamps are twice as energy efficient as the mercury vapor lamps they replace. Metal halides require 60-100 lumens per watt and last on average 10,000-15,000 hours.⁹¹

Induction Lighting⁹²

Induction lighting uses the energy from a magnetic field combined with a gas discharge to create light. It is very energy efficient, has a long life, and produces a high-quality white light. While the other lamp types last on average between 10,000-30,000 hours, the induction lamp has a 100,000-hour life span. Because it is a relatively new technology, induction lighting still has a high upfront cost. The greater efficiency and lower maintenance costs can help to offset the additional cost of the system over the life of the bulbs.

Table: The Pros and Cons of Lamp Options⁹³

	<i>Pros</i>	<i>Cons</i>
MERCURY VAPOR	Inexpensive to install and purchase Medium life Dimmable Good color rendering due to white light	Expensive to operate due to inefficiency Tend to be glary due to intense light Dramatic lumen depreciation over time Use hazardous material (mercury)
HIGH PRESSURE SODIUM	Energy efficient Widely used, reliable Medium life	Orangish-yellow light Safety concerns due to color rendition Cannot restrike immediately
LOW PRESSURE SODIUM	Very energy efficient, medium life Minimum glare Able to restrike immediately Do not attract most insects	Orangish-yellow color Safety concerns due to color rendition Expensive fixtures
METAL HALIDE	Good color rendering More efficient than mercury vapor Widely used	Short life, high maintenance Less efficient than HPS, LPS and Induction High temperatures burn out ballasts
INDUCTION LIGHTING	Energy efficient Low maintenance costs due to long life Good color rendering due to white light Immediate ignition & re-ignition No flickering	High initial cost Difficult to retrofit existing fixtures Use small amounts of mercury Not dimmable Need a high-frequency generator

⁹¹ Ibid.

⁹² Induction Lighting, www.imsasafety.org/journal/septoct04/7.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/InductionLamps.pdf, 25 September 2006.

⁹³ Local Government Commission newsletter www.lgc.org/freepub/PDF/Energy/currents/09_streetlighting99.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/LGC_newsletter.pdf, 29 September 2006.

Lamp and Light Fixtures

A significant factor in the efficiency of a street lighting system is the orientation and design of the lamp and light

fixtures. By focusing light in the direction it is most needed, a light fixture can decrease the total amount of light needed. Additional factors affecting a light fixture's overall efficiency

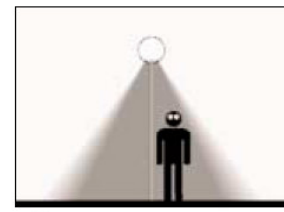
include the lamp's height, the distance between poles, and the fixture's cutoff angle. The most efficient streetlight design is the full cutoff fixture since it does not waste light into the night sky.



① Full Cutoff Fixture



② Semi Cutoff Fixture



③ Non-Cutoff Fixture

Image: from International Dark Sky Association⁹⁴

Remote Streetlight Control

A new technology allows cities to remotely program when streetlights dim or turn off depending on levels of pedestrian and vehicle traffic. The application may offer significant

energy and operational savings. Advocates of the new technology claim that the ability to remotely control street lights could cut energy consumption by as much as 40%.⁹⁵ A field study conducted in Vancouver, British

Columbia, found that one such program, the Lumen IQ system,⁹⁶ reduced electricity consumption for streetlights by 25%. Estimated payback for 100, 250 and 400 watt lamps are 2.68, 1.26, 0.82 years respectively.⁹⁷

High Efficiency Street Lighting

CASE STUDY: Medford, MA

The city of Medford has approximately 4,600 streetlights. Although the local electricity utility owns the majority of the streetlights, the city pays the electricity bill. It has worked closely in conjunction with Massachusetts Electric to

convert all of the city's old mercury vapor lamps to HPS lamps.⁹⁸ According to the city of Medford's Climate Action Plan,⁹⁹ the city expects to save nearly \$20,000 annually on its electricity bill and will reduce its CO₂ emissions by 148 tons.

CONTACT

Environmental Agent
Patricia L. Barry
Department of Energy & Environment Office
(781) 393-2137
pbarry@medford.org

⁹⁴ International Dark Sky Association, www.darksky.org/index.php, 25 September 2006.

⁹⁵ "Streetlight Intelligence Teams With Honeywell to Improve Energy Efficiency," *Business Wire*, 17 November 2005.

⁹⁶ www.streetlightiq.com/products/STI_lumenSIMS.html, 22 September 2006.

⁹⁷ These estimates are based on turning lights off and no cycling or photo control problems, www.bpa.gov/energy/n/tech/energyweb/docs/SlidesPubs/Smart%20Pack_short%20presentation.ppt, 31 October 2006.

⁹⁸ Medford Clean Energy Committee, www.medfordcleanenergy.org/index.html, 30 October 2006.

⁹⁹ Medford Climate Action Plan 2001, www.massclimateaction.org/pdf/MedfordPlan2001.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/MedfordPlan2001.pdf, 25 September 2006.

High Efficiency Street Lighting

CASE STUDY: Flagstaff, AZ

More than half of the city of Flagstaff's street lights are low-pressure sodium lamps. Municipal regulations that limit the total number of lumens per acre have encouraged the conversion of the city's streetlights to LPS. Many citizens of Flagstaff comment¹⁰⁰¹⁰¹

on the positive effects that the lower light levels have on stargazing. The Flagstaff Police Department does not believe that the lower light levels have caused a negative effect on witness or vehicle identification for crime investigations.¹⁰²

CONTACT

Chris Monteverde
Transportation Department
(928) 774-1605
cmonteve@ci.flagstaff.az.us

High Efficiency Street Lighting

CASE STUDY: San Diego, CA

The Gaslamp Quarter in San Diego is a busy pedestrian area with many shops, restaurants and outdoor events. The city of San Diego retrofitted 179 HPS light fixtures with induction lighting in the 16-block Gaslamp Quarter to enhance the ambience and safety of the night-time environment. The city saves approximately \$12,700 a year in maintenance and energy savings from the retrofit. Over the lifetime of the induction

lighting system, the lamps of the HPS system would have had to be replaced about four times. The induction lamp is also brighter than an HPS lamp of the same wattage. Although the HPS lamps are more efficient in lumens per watt, the city saves energy by utilizing a lower wattage induction lamp. The induction lamp system has been praised by San Diego residents for the whiter and fuller light it produces.¹⁰³

CONTACT

Jim Toci
Engineering and Development
Department
(619) 527-8087

¹⁰⁰ "Residents warming up to yellow-lit road" (*Arizona Daily Sun*, 16 Sept. 1987).

www.nofs.navy.mil/about_NOFS/staff/cbl/LPSnet/ADS.870916.html, 22 September 2006.

¹⁰¹ "Romantics, stargazers make case for adding yellow lights" (*Arizona Daily Sun*, 23 October 1987)

www.nofs.navy.mil/about_NOFS/staff/cbl/LPSnet/ADS.871023.html, 22 September 2006.

¹⁰² Letter from Flagstaff Police Department, www.nofs.navy.mil/about_NOFS/staff/cbl/LPSnet/FLAGPDOnLPS.doc, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/FlagstaffPD_LPSletter.pdf, 25 September 2006.

¹⁰³ Currents Newsletter, www.lgc.org/freepub/PDF/Energy/currents/09_streetlighting99.pdf, also archived www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/LGC_newsletter.pdf, 29 September 2006.

Increase Efficiency of Municipal Water and Wastewater Utilities

About 3% of the nation's electricity supply is consumed by water and wastewater utilities.¹⁰⁴ Water and wastewater systems spend about \$4 billion a year on energy to pump, treat, deliver, collect and clean water.¹⁰⁵ This cost can account for as much as one-third of a municipality's total electricity bill.

Many systems operate at less than optimal efficiency. Causes of inefficiency in a water or wastewater system include:

Incorrectly selected and inefficient pumps

Limited capacity in transmission and distribution systems

Lack of automatic or remote control of pumps/ valves

Buying power at peak price times

Operator error

The Environmental Protection Agency (EPA) ENERGY

STAR® program has recently expanded its industrial component to include an evaluation of water and wastewater energy performance.¹⁰⁶ The new program estimates that a 10% reduction in energy use at publicly-owned water and wastewater utilities through cost-effective investments and technology upgrades can save 5 billion kWh of electricity and over \$400 million annually. The upgrades can also result in a significant reduction of total water consumption.

The primary objectives of a municipal water/wastewater system are to supply the water demanded by the public and maintain water quality while minimizing capital costs. Small publicly-owned utilities may believe that they cannot justify a significant investment to reduce the energy costs for a water/wastewater system if the total energy costs are relatively small. However, many efficiency upgrades can provide significant cost savings with a relatively small capital investment.

Large utilities can achieve significant cost savings with a whole-system approach to identifying sources of

inefficiencies in their pumping systems.¹⁰⁷ Life cycle cost analysis can provide insight into the total returns on investment a utility can expect from a more efficient system.

The best way to identify significant cost saving opportunities within a water/wastewater system is to perform an audit. Audits identify the different areas where inefficiencies exist and present costs of implementation and potential savings. Many private energy consulting companies provide such specialized energy audits.

The best bets for significant energy savings in water/wastewater facilities include:¹⁰⁸

Manage demand to avoid peak electric rate periods

Modify or replace inefficient pumps

Install energy efficient motors

Control pump speed and flow electronically with variable frequency drives

Install efficient lighting

¹⁰⁴ EPRI, 1996a, Water and Wastewater Industries: Characteristics and Energy Management Opportunities, Series CR-106941, St. Louis, MO.

¹⁰⁵ Energy Star Water and Wastewater Energy Focus Program Fact Sheet, available online: energystar.gov/ia/business/government/wastewater_fs.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/EnergyStar_wastewater.pdf, 29 September 2006.

¹⁰⁶ Ibid.

¹⁰⁷ For more information on cost-saving opportunities, see the following document(s):
1. Todd Elliot, "Energy-Saving Opportunities for Wastewater Facilities: A Review," Prepared for Energy Center of Wisconsin, June 2003. www.ndwrcdp.org/userfiles/WU-HT-03-33.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/Elliot.pdf, 25 September 2006.

2. Alliance to Save Energy "Watergy" Project, www.watergy.org, 22 September 2006.
¹⁰⁸ EPA Wastewater Management Fact Sheet, www.epa.gov/owm/mtb/energycon_fasht_final.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/EPA_WWTP.pdf, 30 October 2006.

Implement training programs to reduce worker error

The use of renewable energy or fuel cells for power can also increase efficiency, although the initial costs are greater than the other measures listed above.¹⁰⁹

Utilities can reduce the total electricity needed to provide the required services, including replacement of inefficient pumps and motors or minimize the flow rates of water and wastewater on the consumer side through

educational campaigns and strategic pricing. Any municipal policy that aims to increase the overall efficiency of a water/wastewater utility should include a combination of both.

Water and Wastewater Efficiency

CASE STUDY: Columbus, GA

The city of Columbus, Georgia has saved over \$1 million in energy costs over the past five years by overhauling its water utility.¹¹⁰ The Columbus Water Works is a municipally-owned water and wastewater utility that provides services to the community of 186,000 people. An analysis performed by the Water Works identified energy costs as the utility's largest single expenditure. Through a process of reengineering and retrofitting old equipment, the city increased the water system's energy efficiency and cut energy costs significantly.

The retrofit included many different elements. The entire wastewater and drinking water treatment system was reengineered to be fully automated. Old motors throughout the system were replaced with more energy efficient models. Automated motor operators retrofitted onto the system's compressed air blowers reduced the utility's energy costs by 25%, with less than a one year payback.¹¹¹ An energy consultant evaluates the utility's energy use every quarter and recommends improvements.

Employees are encouraged to make recommendations for efficiency improvement projects. Managers and team leaders attend biannual trainings on energy efficiency.

CONTACT

Senior Vice President of Operations
Cliff Arnett
Columbus Water Works
(706) 649-3458
carnett@cwwga.org
www.cwwga.org

Water and Wastewater Efficiency

CASE STUDY: Fairfield, OH

Fairfield Wastewater Treatment Facility in Ohio provides services to 45,000 people. Since 1986, the utility has increased the energy efficiency of its operations through an automated system and continuous technology upgrades.

In 1999 the Wastewater Division implemented a real-time rate-pricing program using data from previous years to calculate an energy usage baseline. When electricity prices peak, the facility uses its automated system to shut down temporarily and save

money. This system has shifted 35–40% of peak loads to cheaper, off-peak periods, resulting in energy bill reductions of up to 17%.¹¹² Continuous monitoring of the system's operations and energy use allow

¹⁰⁹ King County Fuel Cell Demonstration Project, dnr.metrokc.gov/wtd/fuelcell/, 5 December 2006.

¹¹⁰ "Watergy Taking Advantage of Untapped Energy and Water Efficiency Opportunities in Municipal Water Systems", 2002, www.ase.org/uploaded_files/watergy/watergyfull.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/Watergy_2002.pdf, 22 September 2006.

¹¹¹ Ibid.

¹¹² Ibid.

the utility to maintain optimal performance

Fairfield's utility management uses a general set of guidelines to facilitate investment decisions in energy efficiency upgrades. The Fairfield Wastewater policy states that efficiency upgrades that cost less than \$15,000 and have a payback of less than five

years receive automatic authorization. This process gives project managers much more flexibility in including such upgrades in their annual budgets.

There is a 21-member team composed of operations staff members that meets regularly to discuss new technology and

energy efficiency ideas. Fairfield Wastewater also encourages feedback and input from staff at weekly operations meetings.

CONTACT

Drew Young
Fairfield Wastewater Treatment Facility
(513) 867-5369
dyoung@fairfield-city.org

Water and Wastewater Efficiency

CASE STUDY: Austin, TX

The city of Austin Water and Wastewater Utility provides services to over 600,000 people. The semiarid climate of Central Texas requires the city of Austin to manage its water resources wisely. The hilly terrain places a heavy demand on the utility's pumping system.

To reduce the overall energy use of pumping water through the transmission and distribution system, members from several departments meet regularly to share ideas for improving the efficiency of the utility's pumping system. The ad-hoc committee has implemented measures to upgrade the system's pumps to more efficient models and to limit pumping to off peak hours.

The Austin Water and Wastewater Utility interfaces with the largest water consumers in the residential, commercial, and industrial sectors. The utility continuously monitors energy use and water flow through a

series of submeters throughout the distribution system. This information allows the utility to coordinate repairs and upgrades more efficiently. Austin reports a rate of total water loss through its distribution system of only 8%.¹¹³

The utility also monitors water consumption of up to 30 categories of water users, such as hospitals and schools. This data allows the utility to focus its demand-side management efforts on the most egregious wasters of water.

The water utility offers a sizeable incentive to industrial customers for reducing long-term water consumption. The water utility pays one dollar for every gallon of water consumption reduced per day for up to \$40,000 per company. This one-time payment is available to customers of all sizes who make lasting efficiency improvements to their systems.

The city of Austin recently upgraded the pumping system at its municipal power plant, saving millions of dollars a year.¹¹⁴

The city of Austin recently passed a municipal bond authorizing the installation of a reclaimed water pumping system. Any non-potable water users can connect to the system and purchase the cheaper reclaimed water. Clients include industrial users and irrigation companies. The system has a capacity to recycle up to 40 million gallons per day. This greatly reduces the demand for Austin's clean water resources and decreases costs for wastewater treatment.

The utility also markets its water efficiency improvement programs and educates consumers. Consumers pay an additional 1% on their water bills to fund municipal water efficiency projects.

¹¹³ Ibid.

¹¹⁴ For more Austin's pump upgrade project, visit: www.nrel.gov/docs/fy05osti/37537.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/NREL_Austin_spotlight.pdf, 29 September 2006.

Project managers and employees of the Austin Water and Wastewater Utility receive regular updates on system performance and are encouraged to suggest improvements.

CONTACT

Bill Hoffman
City of Austin Water and
Wastewater Utility
(512) 974-2893
www.ci.austin.tx.us/watercon/

Water and Wastewater Efficiency

CASE STUDY: San Diego, CA

The city of San Diego faces a growing demand for water and an increasingly tight supply. It has the unenviable task of maintaining services while minimizing total water consumption due to increased political pressure from other water-deficient cities and states. The daily volume of wastewater transported and treated in the MWWd facilities requires a considerable amount of electrical and thermal power. Pumps, lights, computers, mechanical valves and machinery consume electricity. Thermal energy, usually generated by electrical power or by burning natural gas, provides heat and cooling necessary for both buildings and the wastewater treatment process. It is in the best interest of the city of San Diego and its residents to maximize the potential of their scarce resources by minimizing the energy and water used to provide necessary services.

The San Diego Metropolitan Wastewater Department (MWWd) established a multi-year strategic plan to mitigate the risk of future energy shortages in California. One of the city's

goals is to reduce the energy consumed at wastewater facilities by at least 7%. The MWWd has created an Energy Efficiency Program to achieve this goal.

The MWWd Energy Efficiency Program targets cost-effective ways to achieve water and energy savings in the following areas:

Facility and equipment efficiency upgrades

Water reclamation

Capture and reuse of methane

Cogeneration

The energy savings made by the MWWd and the Energy Efficiency Program maintain lower sewer rates and reduce the risk of rolling electrical blackouts due to excessive peak energy demand.

Point Loma Wastewater Treatment Plant¹¹⁵
Digesters at the Point Loma Wastewater Treatment Plant use heat and bacteria to break down the organic solids removed from wastewater. One of the by-

products of this biological process is methane gas, a potent greenhouse gas that can also be used to generate electricity. The gas emitted from waste is approximately 60% to 65% methane, also known as digester gas (DG).



Image: Point Loma Wastewater Treatment¹¹⁶

MWWd has installed such cogeneration systems in several of its plants. During fiscal year 2000, one wastewater plant saved the city of San Diego more than \$500,000 in energy costs and earned an additional \$400,000 from selling excess power back to the grid.¹¹⁷

California government grants make cogeneration projects more cost-effective. Current grants are approximately \$1,000/kW for reciprocating internal combustion (IC) engines,

¹¹⁵ Point Loma Wastewater Treatment Plant, www.sandiego.gov/mwwd/facilities/ptloma.shtml, 22 September 2006.

¹¹⁶ City of San Diego MWWd website, www.sandiego.gov/mwwd/initiatives/energy.shtml, 22 September 2006.

¹¹⁷ "Watergy Taking Advantage of Untapped Energy and Water Efficiency Opportunities in Municipal Water Systems", 2002, www.ase.org/uploaded_files/watergy/watergyfull.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/Watergy_2002.pdf, 22 September 2006.

\$1,300/kW for microturbines, and \$4,500/kW for fuel cells on renewable fuels like digester gas and landfill gas.

The city of San Diego complements its energy efficiency upgrades with an aggressive demand-side management policy to minimize the total water consumed by the city. Consumers receive information on how to minimize water consumption. San Diego also treats and reuses

wastewater. One of the city's reclamation plants treats up to 30 million gallons of wastewater every day. MWWD sells the reclaimed water at a reduced price to customers for use in landscaping, irrigation, industrial, and agricultural purposes. Pipelines and equipment used in the reclaimed water process are specially marked or color coded to differentiate them from drinking water pipes. MWWD also uses a flow metering alarm

system to minimize undetected sewage spills.

CONTACT

Public Information Officer
Michael Scahill,
[San Diego MWWD](http://www.san-diego-mwwd.org)¹¹⁸
(858) 292 6415

Chair of Energy Committee
Jesse Pagliaro
(619) 221 8728
j3p@sdcity.sannet.gov

Landfill Gas-to-Energy Projects

As trash decomposes, it produces methane gas, a GHG that traps more than 21 times more heat per molecule than CO₂.¹¹⁹ Municipal solid waste landfills account for more than a third of human-related methane emissions in the United States.¹²⁰ Methane gas comprises about one-half of the volume of landfill gas. The other half of the gas is a mixture of CO₂, other gases and traces of organic compounds.

Landfill gas is recovered using a system of wells and either a blower/flare system or a vacuum system. The gas is pumped to a central collector where it is converted into the appropriate form depending on what its ultimate use will be. Methane

can be used to fuel vehicles, supply industrial operations, power an electricity generator or can even be upgraded to higher-quality methane gas for distribution via pipeline. To generate electricity from landfill gas, the methane from the landfill gas is used to power internal combustion engines or turbines. Other technologies for producing electricity from landfill gas are currently under development and may increase the overall efficiency of the process. This process reduces municipal energy costs by providing a low-cost alternative to conventional fossil fuels. Landfill gas that leaks is a wasted economic opportunity.

Capture and use of landfill methane also reduces bad odors and health hazards. A study in the State of New York found that

women living near 38 landfills with landfill gas leaking into the surrounding environment have a four-fold increased chance of bladder cancer or leukemia.¹²¹ As with all waste issues, an essential element of the solution to the problem of landfill gas emissions is reducing the quantity of waste generated.

According to the EPA, there are more than 395 landfill gas capture projects in the country and nearly 600 municipal landfills that could qualify for a methane capture retrofit.¹²² The potential for electricity production at the remaining landfills would be sufficient to provide power to 900,000 homes.¹²³

Since 1979, federal regulations promulgated under Subtitle D of the Resource Conservation and

¹¹⁸ City of San Diego, Metropolitan Wastewater, www.sannet.gov/mwwd/, 29 September 2006.

¹¹⁹ EPA Global Warming Emissions, yosemite.epa.gov/oar/globalwarming.nsf/content/emissions.html, 22 September 2006.

¹²⁰ EPA Landfill Methane Outreach Program, www.epa.gov/lmop/overview.htm#methane, 22 September 2006.

¹²¹ "Investigation of Cancer Incidence and Residence Near 38 Landfills With Soil Gas Migration Conditions, New York State, 1980-1989," State of New York Department of Health, (Atlanta, Ga: Agency for Toxic Substances and Disease Registry, June, 1998). Available from the National Technical Information Service in Springfield, Virginia [800-553-6847]; publication PB98-142144.

¹²² EPA landfill map of projects, www.epa.gov/lmop/docs/map.pdf, also archived 25 September 2006 at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/LandfillGas_ProjectsMap.pdf.

¹²³ EPA LMOP Benefits, www.epa.gov/lmop/benefits.htm, 22 September 2006.

Recovery Act (RCRA)¹²⁴— which regulates the design and operation of municipal solid waste landfills—have required controls on migration of landfill gas. The regulations require methane monitoring and establish standards for methane migration control. Monitoring

requirements apply to a landfill during operation and for a period of 30 years after closure. Landfills affected by RCRA Subtitle D must control gas by establishing a program to periodically check for methane emissions and prevent off-site migration. Gas-to-energy

projects facilitate the achievement of these standards by minimizing the quantity of gas underground and by providing a cash flow in the form of energy to offset the upfront costs of the gas recovery infrastructure.

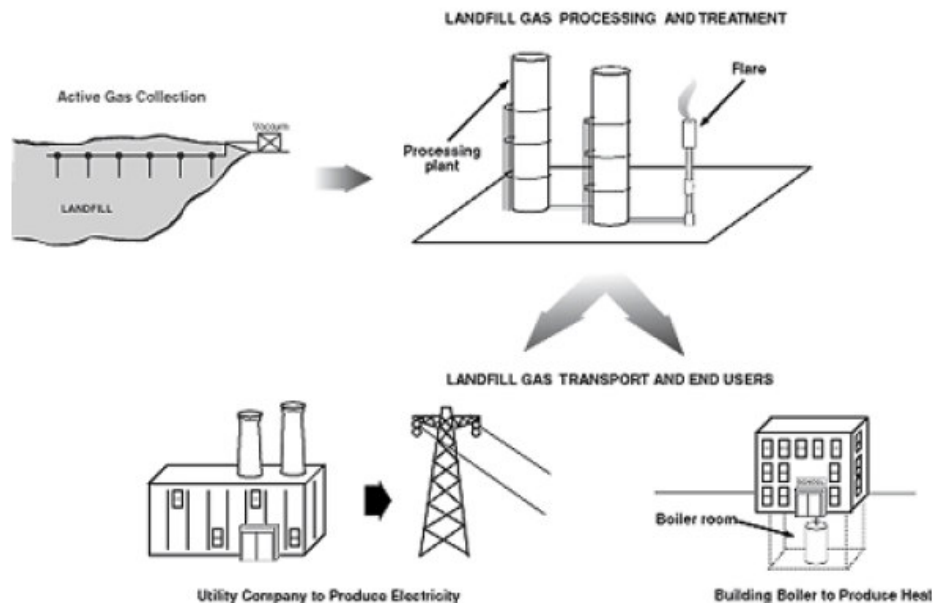


Image courtesy of EPA¹²⁵

Landfill gas can also be used directly in several industrial processes including the operation of boilers, kilns and greenhouses. Most processes that use natural gas or require quantities of heat can substitute the use of landfill gas. The EPA lists the following industries that used landfill gas in their manufacturing and/or industrial processes:

Auto manufacturing

Chemical production

Food processing

Pharmaceuticals

Cement and brick manufacturing

Wastewater treatment

Consumer electronics and products

Paper and steel production

Some landfill gas recovery projects utilize cogeneration to increase the overall efficiency of the recovery and reuse process. The thermal energy produced as part of the electricity generation process can be stored in the form of steam or hot water and used

for heating, cooling or other applications.

Landfill gas recovery and reuse:

Reduces emissions of a potent greenhouse gas

Offsets use of non-renewable sources of energy (natural gas, coal, oil)

Provides low-cost source of electricity

Minimizes odors emitted from landfills

¹²⁴ RCRA Regulations: www.access.gpo.gov/nara/cfr/cfrhtml_00/Title_40/40cfr258_00.html, 22 September 2006.

¹²⁵ EPA LMOP, www.epa.gov/lmop/over-photos.htm#3, 27 September 2006.

Eliminates health risks associated with organic compounds in landfill gas

Reduces risk of explosion from built-up methane gas pockets
Benefits local economy

Reduces cost of compliance with local, state and federal air quality regulations

Landfill Gas to Energy Projects

CASE STUDY: Los Angeles, CA

The Sanitation Districts of Los Angeles County (Districts) began recovering the estimated 26,000 cubic feet per minute (cfm) of landfill gas generated at Puente Hills Landfill, the largest landfill in the nation, in the 1980's.¹²⁶ The intent of the landfill gas collection project was to minimize landfill gas emissions to the atmosphere and limit below-ground migration of the gas in accordance with federal regulations. The Districts originally used the landfill gas to fuel an electricity production facility that has been operating at the site since January of 1987. After noticing that a percentage of the gas was not being utilized and had to be flared, the Districts decided to begin converting that gas to vehicle fuel.

In October of 1993, the Districts opened the country's first facility to convert landfill gas to vehicle fuel. Wells inserted deep into the landfill capture the gas and transport it to a processing facility where it is purified through membranes to remove CO₂ and water vapor. The resulting compressed natural gas (CNG) is used as a fuel for landfill equipment, garbage trucks, water trucks and employee rideshare vans.

Landfill gas from Puente Hills is also transported to the Districts' Joint Administrative Office where it is used for heating and cooling. The Districts also sell a portion of the gas to Rio Hondo College for heating school facilities and for

powering a CNG vehicle.

The Puente Hills gas-to-energy facility produces enough CNG fuel for a fleet of 11 vehicles and produces about 50 megawatts of power, enough to provide electricity to 70,000 homes. The Districts operate two smaller gas-to-energy facilities, Palos Verdes (6 MW) and Spadra (8.5 MW). Since the capital costs of all three facilities have already been recuperated, the Districts only pay for maintenance and operation costs of the facilities. This amount is more than offset by the sale of electricity to local utilities. In 1997, electricity sold from the Puente Hills facility alone amounted to \$16.5 million in net revenues.¹²⁷

Puente Hills Landfill



Image courtesy of Los Angeles County Sanitation District¹²⁸

¹²⁶ LA County Sanitation Districts, www.lacsd.org/swaste/Facilities/LFGas/CNGFacility.htm, 22 September 2006.

¹²⁷ LA County Sanitation District, www.lacsd.org/swaste/Facilities/LFGas/Gas-To-EnergyFacilities.htm, 27 September 2006.

¹²⁸ LA County Sanitation District, www.lacsd.org/swaste/Facilities/LFGas/CNGFacility.htm, 27 September 2006.

The project prevents the release of large quantities of landfill gas to the atmosphere and helps minimize the accumulation of nitrogen oxides (NOx) that contribute to the formation of smog. With greenhouse gases

now being regulated in California, the project may potentially minimize the regulatory costs of compliance that other landfills without gas recovery mechanisms may face.

CONTACT

Sanitation Districts of Los Angeles County
Solid Waste Management Department
1955 Workman Mill Road
P.O. Box 4998
Whittier, CA 90607
(562) 908-4288, extension 2428

Landfill Gas to Energy Projects

CASE STUDY: Riverview, MI

The city of Riverview, Michigan, owns and operates the Riverview Land Preserve landfill in Wayne County. In a joint project with the local utility, Detroit Edison, the city recovers and sells landfill gas to generate energy. The partnership began in 1987 with the development of a landfill gas-to-energy project on the 212-acre landfill. A subsidiary of Detroit Edison collects the gas and sells it to Riverview Energy Systems, where it generates electricity in two gas turbines. Detroit Edison then purchases the electricity under a 25-year power purchase agreement. The gas-to-energy project provides enough electricity for 3,700 homes.

The city has achieved attainment of federal methane gas migration requirements at its landfill in a cost-effective way. The project provides revenue directly to the city as stipulated in the terms of the contract. Since the installation of the project facilities, property values surrounding the landfill have increased and new neighborhoods have been constructed. The so-called “Mount Trashmore” that was once an eyesore and a safety hazard has also been turned into a wintertime skiing and recreation area.

The Riverview gas-to-energy project is a good example of local governments and local industries collaborating to achieve positive results. Detroit Edison not only receives a locally produced and inexpensive source of electricity, but also the positive publicity that this project continues to generate.¹²⁹

CONTACT

Director
Bob Bobeck
Riverview Land Preserve
(734) 281-4263
rbobeck@cityofriverview.com

¹²⁹ EPA LMOP Riverview Project, www.epa.gov/lmop/res/riverview.htm, 27 September 2006.

CASE STUDY: Orange County, FL

Orange County's landfill gas-to-energy system collects gas from the 200 acres of waste at the Orange County landfill. The gas is piped to the Stanton Energy Center where it is used to fuel a generator. The landfill produces an estimated 6,000 cfm of gas, enough fuel to generate electricity for 13,000 homes.¹³⁰

The Orange County Solid Waste Department sold the landfill project to DTE Biomass which will own and operate the landfill gas recovery project over the term of a 20-year contract with Orange County. The project

received \$4 million in federal funding and also benefits from multiple tax incentives.

Orange County recuperated its initial costs with the sale of the project for \$5 million and will earn an estimated \$400,000 annually on the landfill gas rights. The project reduces methane emissions by 31,000 tons per year.

The Orange County Solid Waste Department worked closely with the EPA's Landfill Methane Outreach Program (LMOP) in the development of this project. The

LMOP provides information on technologies to help optimize efficiency and production while minimizing the costs of the gas recovery system. They work with several municipalities across the country in the design and implementation of landfill gas-to-energy projects. Orange County received recognition from the EPA as the 1998 Partner of the Year.

CONTACT

Orange County Solid Waste Department
Solid.Waste@ocfl.net

¹³⁰ EPA Landfill Methane Outreach Program www.epa.gov/lmop/res/orange.htm, 27 September 2006.

Additional Resources

LED and Traffic Flow Management:

Margaret Suozzo, A Market Transformation Opportunity Assessment for LED Traffic Signals, April 1998

www.cee1.org/gov/led/led-ace3/ace3led.pdf#search=%22berkeley%20led%20traffic%20lights%20pacific%20gas%22

Optimizing Traffic Light timing through simulations

www.informs-cs.org/wsc04papers/188.pdf

Dallas Light timing program to improve air quality

www.dallascityhall.com/pdf/pio/CooperativeProgram.pdf

U.S. Climate Change Technology Program

www.climatechange.gov/library/2005/tech-options/tor2005-114.pdf

California Energy Commission LED Replacement Program

(Has list of project costs for many California cities)

www.energy.ca.gov/releases/2002_releases/2002-03-14_led_signals.html

State of Illinois LED Traffic Signal Rebate Program Application

www.illinoiscleanenergy.org/images/ICEFC_PDFs/2006%20LED%20Application%20Fill-in.pdf#search=%22chicago%20LED%20traffic%20%22

Seattle Department of Transportation Traffic Signal Optimization Program, www.seattle.gov/transportation/signaloptimization.htm

Institute of Transportation Engineers, Traffic Signal Timing,

www.ite.org/signal/optimization.asp

Efficient Streetlights

Lincoln, NE street lighting policies

www.ci.lincoln.ne.us/City/attorney/designs/ds230.pdf

Issues and Facts about Low Pressure Sodium Lighting

www.nofs.navy.mil/about_NOF/S/staff/cbl/LPSnet/LPS-references.html

Lighting Rates for Palo Alto

www.cpau.com/docs/rates/ratespdf/E14-070105.pdf

International Dark-Sky Association

www.darksky.org/

The Local Government Commission (LGC) is a

nonprofit, nonpartisan, membership organization that provides inspiration, technical assistance, and networking to local elected officials and other dedicated community leaders who are working to create healthy, walkable, and resource-efficient communities.

www.lgc.org/index.html

Efficient Water and Wastewater Utilities

Consortium for Energy Efficiency (CEE) Resources Page

www.cee1.org/ind/mot-sys/www/cr.php3

EPA Wastewater Management Fact Sheet

www.epa.gov/owm/mtb/energycon_fasht_final.pdf

Watergy

www.watergy.org

Alliance to Save Energy

www.ase.org

U.S. Department of Energy, Office of Industrial Technology

www1.eere.energy.gov/industry/

Office of Industrial Technology Software Tools

www1.eere.energy.gov/industry/bestpractices/software.html

Wisconsin Wastewater Operator's Association

www.wwoa.org

King County Fuel Cell Demonstration Project

dnr.metrokc.gov/wtd/fuelcell/

World Health Organization (WHO)-Regional Centre for Environmental Health Activities

www.emro.who.int/ceha/clearing_h_waterdemand/portals/wutiliz/index.asp

"Major Sources of Efficiency Savings", *Future Investment in Drinking Water and Wastewater Infrastructure*, November 2002. www.cbo.gov/showdoc.cfm?index=3983&sequence=6

“Motor System Efficiency in Water and Wastewater Systems: A Call to Action”, American Council for an Energy-Efficient Economy, 2002.

www.cee1.org/ind/mot-sys/ww/call.pdf

Green Pages – Service Providers for Municipal Wastewater Treatment Systems

www.eco-web.com/index/category/2.2.html

Lawrence Berkeley National Laboratory Water and Energy Technology Team

water-energy.lbl.gov/index.php?waste_water

Water Conservation Program in Mountain View, CA

The city of Mountain View, California has a very comprehensive water conservation program to provide resources and incentives to both commercial and residential customers. For information on the program, visit:
www.ci.mtnview.ca.us/living/water_conservation.htm

Northwest Energy Efficiency Alliance Case Studies

[Ellensburg Wastewater Treatment Plant¹³¹](#)
[Kennewick Wastewater Treatment Plant¹³²](#)

DMOZ Water Utility Open Directory of Companies
dmoz.org/Business/Energy_and_Environment/Utilities/Water/

City of San Diego Metropolitan Wastewater Energy Efficiency Program

www.sandiego.gov/mwwd/initiatives/energy.shtml

Water and Wastewater International Publication Article on Cogeneration for Municipal Wastewater

www.pennnet.com/Articles/Article_Display.cfm?Section=ARTCL&ARTICLE_ID=254314&VERSION_NUM=2&p=20

Anaerobic Digester Methane to Energy A Statewide Assessment, 2003, Prepared for Focus on Energy

www.focusonenergy.com/data/common/pageBuilderFiles/Anaerobic_Report.pdf

Landfill Gas to Energy:

EPA Landfill Methane Outreach Program

www.epa.gov/lmop/

Landfill Gas Control Measures
U.S. Department of Health and Human Services

Agency for Toxic Substances and Disease Registry

www.atsdr.cdc.gov/HAC/landfill/PDFs/Landfill_2001_ch5.pdf#search=%22riverview%20michigan%20landfill%20gas%22

EPA LMOP Database of Participating Municipalities

www.epa.gov/lmop/proj/xls/lmopdatami.xls

(link to Excel spreadsheet)

More Case Studies

www.epa.gov/lmop/res/index.htm#4



**NATURAL
CAPITALISM
SOLUTIONS**

NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548

¹³¹ Case study archived, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/Ellensburg_case.pdf, 27 September 2006.

¹³² Case study archived, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/Kennewick_case.pdf, 27 September 2006.

Chapter 5: Develop a Local Action Plan

Best Bets

Municipal Transportation

DOCUMENT CONTENTS

Reduce Municipal Vehicle Fleet Emissions.....	55	Programs to Reduce Driving.....	63
Hybrid.....	56	CASE STUDIES:	
CASE STUDY:		Oakland, CA.....	64
King County, WA	56	Pleasanton, CA	64
Alternative Fuels.....	57	Modify Transportation Contracts to Incentivize Alternative Fuel Use.....	65
Electricity	57	Alternative Fuels for School Buses	65
CASE STUDY:		CASE STUDIES:	
Chattanooga, TN.....	57	Saint Johns, MI.....	66
Biodiesel	58	Warwick, RI	66
CASE STUDY:		Alternative Fuels for Waste Haulers.....	67
San Francisco, CA	58	CASE STUDIES:	
Hydrogen	59	Los Angeles, CA.....	68
Compressed Natural Gas ..	59	Hybrid Technology for Refuse Vehicles.....	69
Ethanol	59	Bio-Methane	69
CASE STUDY:		Additional Resources	70
Minneapolis, MN	60		
Idle Reduction Campaigns	60		
CASE STUDIES:			
Mississauga, Canada.....	61		
Lane County, Oregon.....	62		

Reduce Municipal Vehicle Fleet Emissions

Reducing the amount of emissions produced by municipal vehicle fleets has the potential to make a significant contribution to a city's greenhouse gas (GHG) reduction targets. It will also save money and create a more beautiful place to live, work and play. Vehicle emissions reductions are a particularly visible area for improvement given the highly publicized nature of rising gasoline prices and the ensuing debate over foreign oil dependency. Vehicle emissions reductions can be applied to city transit, employee cars, police patrol cars, waste removal trucks, school buses, street sweepers or any other vehicle in the municipal fleet.

Although the initial cost of emissions reduction options is often higher than continuing to use conventional vehicles, in the longer-term, fuel-efficient or alternative fuel options will save costs and pay for themselves many times over.

Municipal vehicle fleet emissions reductions can occur through the use of hybrid and other highly efficient vehicles, the introduction of alternative fuels, and campaigning for idle reduction policies. The best strategy is diversification in order to try out pilot projects for what works best and still prepare for advancements in different sectors. The city of Seattle's Clean and Green Fleet Action Plan (being revised and updated) is a good model for how to create a diversified strategy. The 2003

document still available on their website summarizes Seattle's plan to implement cleaner operating vehicles and increase vehicle efficiency and use by breaking down the programs, recommended actions, cost impacts, environmental impacts and departmental lead. The State of Washington is modifying the guide for its own use.¹³³

Hybrid

Hybrid electric vehicles (HEVs)¹³⁴ are efficient vehicles that use a small motor and an electric engine to generate the power to operate the vehicle. Today, most people have heard of an HEV and many people have a basic understanding of how they work.

In addition to offering reduced

emissions of GHG, hybrid vehicle technologies are worthy of adoption due to their high fuel economy, which helps reduce dependence on petroleum from foreign sources and saves money.

One practical and highly visible method of implementing hybrid vehicles in any city is to ensure that the Mayor is transported around the city in a hybrid. This provides leadership by example and serves as a visual statement that reducing emissions and air pollution, and contributing to climate protection are important priorities.

Efficiency savings depends on the make and model of HEV, since some use the technology to increase power instead of mileage efficiency.¹³⁵

Municipal Fleet Emissions Reduction

CASE STUDY: King County, WA

In 2004, King County, Washington purchased 235 hybrid diesel-electric buses to replace the existing fleet.¹³⁶ This purchase is expected to reduce fuel consumption by 750,000 gallons a year, and save \$3.5 million annually in both fuel and maintenance costs. The hybrids cost \$645,000 each—about \$200,000 more than a traditional diesel bus. The up front cost of \$47 million was expected to pay

for itself in about 13 years. As of 2006, given higher fuel costs, it is expected to be a 8 year payback.

In 2006, King County had the National Renewable Energy Laboratory (NREL) perform a fuel economy comparison. The hybrid diesel-electric buses performed 29% better than conventional buses on King County routes and showed a

32% GHG emission reduction. In addition to purchasing the hybrid diesel-electric buses the county is also converting all existing and new buses to biodiesel (B20).¹³⁷

CONTACT

Jim Boon
King County Department of Transportation
(206) 684-1498

¹³³ Seattle Clean and Green Fleet Action Plan, www.seattle.gov/environment/Documents/CleanGreenFleetAP.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/TransportationMunicipal/Seattle_CleanGreenFleetAP_2003.pdf, 5 December 2006.

¹³⁴ For more information about Hybrid electric vehicles, www.eere.energy.gov/cleancities/hev/what_is_hv.html, 29 September 2007

¹³⁵ To determine what the mileage savings are refer to www.fueleconomy.gov, 30 October 2006.

¹³⁶ For more information, www.metrokc.gov/kcdot/news/2004/nr040527_hybrids.htm, 27 July 2006.

¹³⁷ Personal Communication with Jim Boon, 2 October 2006.

Alternative Fuels

Alternative fuels, as defined by the Energy Policy Act of 1992, include ethanol, natural gas, propane, hydrogen, biodiesel, electricity, methanol and p-series fuels. Using these alternative fuels in vehicles can generally reduce harmful pollutants and exhaust emissions. Also, most of these fuels are produced domestically and derived from renewable sources. It is important to diversify the cities'

alternative fuel programs to both to try different programs and prepare for advancement in different sectors technology.

Electricity

Electricity can be used as a transportation fuel to power battery electric and plug-in hybrid vehicles. Pure electric vehicles or EVs, require a large energy storage device, such as a battery. EV batteries have a limited storage capacity and their electricity must be replenished

by plugging the vehicle into an electrical source. The electricity for recharging the batteries can come from the existing power grid, or from distributed renewable sources such as solar or wind energy. Plug-in Hybrid vehicles use smaller batteries changes when a power source is available, or their fuel tank when it is not, hence the name "plug-in." See Fuel Transitioning for more information on plug-in hybrids¹³⁸

Municipal Fleet Emissions Reductions

CASE STUDY: Chattanooga, TN

Chattanooga and Hamilton County, Tennessee¹³⁹ are reversing a history of environmental neglect by infusing sustainability concepts and practices into all aspects of local planning and public services. A prominent example of local sustainability initiatives, the transit authority for the city of Chattanooga and Hamilton County formed an innovative public-private partnership to develop, build, test and operate electric transit vehicles (ETVs) and ETV systems in downtown Chattanooga. Since 1991, 10 electric buses have gone in service on a downtown shuttle route, a local non-profit has been launched to promote research and provide information and a company has been formed to

manufacture electric buses. Program benefits include reduced congestion on downtown streets, reduced air emissions, and over 30 new manufacturing jobs.

Emission reductions include:

Particulate emissions avoided - 600 lbs. per year (0.27 metric tons)

CO emissions avoided: 2,900 lbs. per year (1.32 metric tons)

NOx emissions avoided: 10,800 lbs. per year (4.90 metric tons)

CO₂ emissions avoided: 3.5 million lbs. per year (1587.57 metric tons)

Local Economic activity includes:

AVS, Chattanooga's electric bus manufacturer has sold 29 buses - more than 60% of electric transit vehicle sales outside California. Local electric bus manufacture supports 35 jobs.

Shuttle system related retail development is projected to reach \$12 million generating \$800,000 in city and county tax revenue.

CONTACT

Communications Director
Todd Womack
Chattanooga City Council Transit Authority
(423) 757-5168

¹³⁸ U.S. DOE www.eere.energy.gov, 27 September 2006.

¹³⁹ Smart Communities Network, www.smartcommunities.ncat.org/success/chattano.shtml, 27 September 2006.

Biodiesel¹⁴⁰

Biodiesel is a domestically produced, renewable fuel that can be manufactured from vegetable oils, animal fats, or recycled restaurant greases. Biodiesel is safe, biodegradable and reduces serious air pollutants such as particulates, carbon monoxide, hydrocarbons and air toxics. Blends of 20% biodiesel with 80% petroleum diesel (B20) can generally be used in unmodified diesel engines; however, users should consult their original equipment manufacturer engine warranty statement. Biodiesel can also be used in its pure form (B100), but

it may require certain engine modifications to avoid maintenance and performance problems and may not be suitable for wintertime use.

According to the U.S. Department of Energy, B100 reduces CO₂ emissions by more than 75% over petroleum diesel. Using a blend of 20% biodiesel reduces carbon dioxide emissions by 15%. Biodiesel also produces less of other air pollutants, including particulate matter, carbon monoxide (CO) and sulfur dioxide (SO₂) emissions.¹⁴¹

Currently, a federal biodiesel tax incentive is helping reduce the cost of biodiesel.¹⁴² The credit equates to a one penny per percent of biodiesel in a fuel blend made from agricultural products like vegetable oils, and one-half penny per percent for recycled oils. This incentive is taken by petroleum distributors and passed on to consumers. A USDA study estimated this incentive will increase the demand for biodiesel to at least 124 million gallons per year. And depending on other factors, including crude oil prices, the industry projects that demand could be much higher.

Municipal Fleet Emission Reduction

CASE STUDY: San Francisco, CA¹⁴³

In 2006 the city of San Francisco's Mayor Gavin Newsom signed an Executive Directive to accelerate the pace of biodiesel use in city fleets.¹⁴⁴ The city has been a long-term user of a B20 biodiesel blend (80% petroleum diesel, 20% biodiesel) with the San Francisco Airport, Department of Public Works, MUNI buses, San Francisco Zoo and ferries using the fuel successfully.

The directive calls for fleet managers to identify vehicles that can be quickly transitioned to B20 use and make the necessary

preparations for this transition. All diesel-using departments are required to begin using biodiesel as soon as is feasible with the following targets: 25% use of B20 by March 31, 2007 and 100% use by December 31, 2007. San Francisco uses about 8 million gallons of diesel a year, so the shift to B20 will result in significant petroleum displacement and emissions reduction. In related news, the San Francisco Fire Department has announced a pilot program to test B20 in two fire trucks, six engines and one ambulance. The pilot will be conducted in the

southeastern part of the city, which struggles with poor air quality.

The National Biodiesel Board (NBB) has recently praised the city of San Francisco for its commitment to biodiesel. Joe Jobe, CEO of NBB said, "This makes San Francisco the largest U.S. city ever to institute such broad biodiesel use."

CONTACT

Clean Air Program at the Department of the Environment (415) 355-3700

¹⁴⁰ U.S. DOE, www.eere.energy.gov, 5 October 2006.

¹⁴¹ An Overview of Biodiesel and Petroleum Diesel Lifecycles, USDA and DOE joint report, 1998, www.nrel.gov/docs/legosti/fy98/24772.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/TransportationMunicipal/USDA_DOE1998.pdf, 30 October 2006.

¹⁴² To learn more about the biodiesel tax incentive, go to the National Biodiesel Board's Tax Incentive website: www.nbb.org/news/taxincentive/, 30 October 2006.

¹⁴³ National Biodiesel Board www.biodiesel.org/resources/pressreleases/fle/20060522_sanfran_b20nrfinal.pdf#search=%22San%20Francisco%20Biodiesel%20program%22, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/TransportationMunicipal/2006_sanfran_b20nrfinal.pdf, 27 September 2006.

¹⁴⁴ San Francisco Executive Directive, www.newrules.org/de/archives/000124.html, 5 October 2006.

Hydrogen

Hydrogen (H₂) could play an important role in developing sustainable transportation in the U.S., because in the future it may be produced in virtually unlimited quantities using renewable resources. While hydrogen technology is still evolving, the fuel has been used effectively in a number of internal combustion engine vehicles mixed with natural gas. Hydrogen has the potential to be a major fuel source in the longer term, but the technology will not be market-ready in the short term. (See Renewable Energy Planning for more information on Hydrogen as an alternative energy source)

Compressed Natural Gas (CNG)

Natural gas is domestically produced and readily available to end-users through the utility infrastructure. It is also cleaner burning and produces significantly fewer harmful emissions than reformulated gasoline or diesel when used in [natural gas vehicles](#).¹⁴⁵ A study conducted by NREL in 2000 compared CNG, bi-fuel CNG and gasoline vans on pre-existing routes in Colorado. The study found CO₂ emissions were 22% to 25% less for the CNG vans than their gasoline counterparts.¹⁴⁶ In addition, commercially available medium- and heavy-duty natural gas engines have demonstrated over 90% reductions of CO and

particulate matter and more than 50% reduction in NO_x relative to commercial diesel engines. Natural gas can either be stored onboard a vehicle as compressed natural gas (CNG) at 3,000 or 3,600 psi or as liquefied natural gas (LNG) typically at 20-150 psi.

Ethanol

Ethanol is an alcohol-based alternative fuel produced by fermenting and distilling starch crops that have been converted into simple sugars. Feedstocks for this fuel include corn, sugar, barley and wheat. Ethanol can also be produced from "cellulosic biomass" such as trees and grasses. The technology for this "cellulosic ethanol" still needs further development for the fuel to be cost effective. However, this fuel source has great potential. Ethanol is most commonly used to increase octane and improve the emissions quality of gasoline.

Ethanol can be blended with gasoline to create E85, a blend of 85% ethanol and 15% gasoline. E85 and blends with even higher concentrations of ethanol, E95, for example, qualify as alternative fuels under the [Energy Policy Act of 1992](#) (EPAct)¹⁴⁷. Vehicles that run on E85 are called flexible fuel vehicles (FFVs) and are offered by several car manufacturers. There are already more than 6 million E85 compatible vehicles on American roads.¹⁴⁸ Enabling

these owners to have access to E85 stations, due to the limited suppliers in many states, is now the challenge.¹⁴⁹

Benefits of using Ethanol (E 85) include:

Ethanol reduces demand for imported oil.

Ethanol is a renewable fuel source. In MN ethanol is made from starch found in corn and cheese-making byproducts.

It is safe and approved. E85 is made from 85 % ethyl alcohol (ethanol) and just 15% petroleum, and is approved by all flexible fuel vehicle manufacturers.

E85 reduces ozone-forming pollution by 20% and GHGs by nearly 30%.

Ethanol is less toxic and therefore reduces the release of the compounds like benzene, toluene and xylene, which are required in gasoline.

Ethanol boosts engine horsepower. E85 has a 105 octane rating and burns cooler than gasoline, keeping engines clean.

Cost. E85 is typically costs less than gasoline.

Cleanup. Ethanol degrades quickly in water, which reduces gasoline spills and leaks.

¹⁴⁵ U.S. DOE Alternative Fuels, www.eere.energy.gov/afdc/afv/gas_vehicles.html, 30 October 2006.

¹⁴⁶ NREL SuperShuttle CNG Fleet Evaluation Report, 2000, www.eere.energy.gov/afdc/pdfs/supershuttle_final.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/TransportationMunicipal/NREL_supershuttle.pdf, 30 October 2006.

¹⁴⁷ Freedom Car and Vehicle Technologies Program www1.eere.energy.gov/vehiclesandfuels/epact/, 30 October 2006.

¹⁴⁸ National Ethanol Vehicle Coalition, www.e85fuel.com/index.php, 5 December 2006.

¹⁴⁹ National Ethanol Vehicle Coalition, Refueling station locator, www.e85refueling.com/, 5 December 2006.

CASE STUDY: Minneapolis, MN

The city of Minneapolis¹⁵⁰ fleets included 53 E85 vehicles, 5 hybrids and 3 maintenance shop tricycles as of March 2006. In 2005, their vehicles and equipment used 1,100,000 gallons of ultra low sulfur unleaded gasoline¹⁵¹ and 760,000 gallons of B5 fuel (5% biodiesel). In 2004, the city contracted with a local gas station to provide E85 fuel to its vehicles but the station was not conveniently located. The city's 2006 plan includes lessons learned in 2004 & 2005, and is developing an

E85 fueling station at its most heavily used maintenance facility.

Costs of using Ethanol in Minnesota:

Vehicle cost: Flexible Fuel Vehicles (FFV) cost about the same as regular vehicles.

Fuel cost: E85 is \$1.99/gallon at area gas stations compared to over \$2.65/gallon for regular unleaded gas.

Fuel location: The city of Minneapolis and Hennepin County are jointly funding the new E85 Fueling Station. Hennepin plans to purchase E85 vehicles.

CONTACT

Environmental Manager
Gayle Prest
Department: Minneapolis
Environmental Services
(612) 673-2931
Gayle.Prest@ci.minneapolis.mn.us

Idle Reduction Campaigns

"Idle reduction" is typically used to describe technologies and practices that reduce the amount of time heavy-duty trucks and cars idle their engines. Reducing idle time saves fuel, engine wear and money. In addition, it reduces emissions and noise.

Ten Tips to Conduct an Anti-Idling Campaign^{152,153} from Mississauga, Canada

1. Attack the myths about engine idling
Three major idling myths need to be challenged:

- Your engine should be warmed up for long periods before driving;
 - Idling is good for your engine; and
 - Shutting off and restarting your vehicle is hard on the engine.
- You need to put these front and center in your campaign along with the facts. The myths and facts are important information that should be in the information materials, Web site, etc.
2. Get your own house in order
For municipalities, your message goes a long way with the public if you first get your own house in order. The

must take the lead on issues like idling, so launch a workplace initiative to reduce idling across municipal operations.

3. Partnerships are key to success
To effectively implement your campaign, you need to develop local community partners, for example, local school boards and universities.
4. Finding and managing project staff
Use a community-based social marketing approach. This involves personal "interventions" or, personal

¹⁵⁰ U.S. Conference of Mayors Energy & Environment Best Practices Survey Report, mayors.org/uscm/best_practices/EnergySummitBP06.pdf#search=%22ethanol%20E85%20best%20practices%20city%22, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/TransportationMunicipal/EnergySummitBP06.pdf, 26 October 2006.

¹⁵¹ Ultra low sulfur diesel can reduce GHG and other air pollutants. EPA National Clean Diesel Campaign, www.epa.gov/cleandiesel/, 19 October 2006.

¹⁵² Mississauga, Canada
www.mississauga.ca/portal/residents/idlefree?paf_gear_id=10200022&itemId=42200036&returnUrl=%2Fportal%2Fresidents%2Fidlefree, 27 September 2006.

¹⁵³ Canada Natural Resource Idling Information Page, oee.mcan.gc.ca/communities-government/idling.cfm?attr=12, 27 September 2006.

interactions by project staff to encourage drivers in reducing idling at community locations. You need people power to do the interventions and it can be tricky to find and manage the staff. Determine if there are environmental internship programs at the local university for resource help.

5. Council and senior management support is critical
For municipalities, foster strong support from your council and senior management. Your mayor could help launch the campaign and formal council endorsement should be sought. In Greater Sudbury, the anti-idling campaign was adopted by Earthcare Sudbury, a partnership of the city and 40 community groups; this helped to cultivate broad-based community support and awareness.

6. Utilize pre-existing campaign materials
Draw extensively on the images, information and

graphic materials available on NRCan's Idle-Free Zone Web tool kit. Create your own new tools using the web site images, including t-shirts, radio spots, letterhead, a dedicated anti-idling web site, etc. The tool kit is a great starting point, and you can tailor it for local use. You need to know your community and what the local hooks are.

7. Schedule field work during consistently moderate temperatures
Schedule the implementation of initiatives when temperatures are expected to be consistently moderate, such as spring and early fall, for all aspects of field work (re: pre-intervention data collection, interventions, and post-intervention data collection.
8. Focus on your target audience
Some audiences are more receptive to the anti-idling message than others. In the city of Mississauga's experience, the most successful component was drivers (i.e., parents and

caregivers) at elementary schools who are concerned about the health of their children. Information kits distributed to schools educated children about idling and the kids then took the message home.

9. Build a campaign web site
A web site is a great low-cost way to make anti-idling information readily accessible and allows regular updates as the campaign progresses. A contact e-mail address allows visitors to make inquiries, comments or suggestions easily, and response time and printing costs can be minimized by referring to the Web site.
10. The message should be visible and memorable / communications input
Use strong messaging and images (i.e., vehicle tailpipe that looks like a smoking gun), and colors to promote the campaign. Your campaign will also go smoother if you have communications expertise on your project team.

Municipal Fleet Emission Reductions

CASE STUDY: Mississauga, Canada¹⁵⁴

In 2002, the city of Mississauga partnered with Natural Resources Canada to conduct a "*Towards an Idle-Free Zone in the city of Mississauga*" campaign. The city utilized many of the communications tools

Natural Resources Canada provided and aimed the campaign at public awareness, schools, residential, workplace, private sector, transit education and municipal hotspots. A few of the results are listed next.

Results of the Workplace Initiative:

96% of city employees were aware of the anti-idling campaign;

¹⁵⁴Mississauga Idle Free Campaign, www.mississauga.ca/portal/residents/idlefree, 27 September 2006.

31% reported that the campaign had changed their idling behavior;

Meetings with transit management have resulted in a new policy reducing the maximum idling time for city buses from 15 minutes to 5 minutes¹⁵⁵

Results of School Initiative

Before the interventions were conducted, 54% of drivers were observed idling their vehicles while waiting for children.

Almost 500 drivers were approached at 20 elementary schools visited by campaign staff

The frequency of idling decreased from 54% to 29%

The duration of idling decreased from 8 minutes to 3.5 minutes.

CONTACT

Environmental Coordinator
Brenda Sakauye
Transportation and Works
Department
(905) 615-3217
brenda.sakauye@mississauga.ca

Municipal Fleet Emission Reductions

CASE STUDY: Lane County, OR

The Lane Regional Air Protection Agency (LRAPA) created the Everybody Wins Program as a project to reduce diesel emissions from idling heavy-duty trucks.¹⁵⁶ LRAPA developed an innovative lease-to-own program to help truckers reduce their idling time through the use of auxiliary power units (APUs). APUs were installed on 100 trucks in Phase 1 of the program, which helped to develop the installation and service infrastructure to support APU technology on the I-5 corridor in Oregon. Phase I of the project is expected to conserve around 1 million gallons of diesel fuel over the life of the 100 APUs and

reduce idling emissions in the trucks with APUs by 75%-90%.

Phase 2 of the program is now underway, with the goal of installing another 250 APUs by 2007. LRAPA received a \$500,000 grant from the Environmental Protection Agency (EPA) SmartWay Transport Partnership for the second phase. In Phase 2, LRAPA will place passive GPS data loggers on board 100 of the 250 trucks to track the usage of APUs. After a year of data on the APUs has been collected, LRAPA will submit a case study report to the EPA, which will then be used to demonstrate the effectiveness of

the idle reduction technology to the trucking industry.¹⁵⁷ As a result of the program, the non-profit Cascade Sierra Solutions was created in March 2006 with the mission of continuing and expanding the Everybody Wins Program throughout Oregon, Washington and California.¹⁵⁸

CONTACT

Angelique Dodaro
Cascade Sierra Solutions
Phone: (541) 302-0900

Gordon Griffin
LRAPA, Diesel Projects
Phone: (541) 736-1056

¹⁵⁵ oee.rncan.gc.ca/transportation/idling/material/reports-research/cppi-final-report.cfm?attr=28, 27 September 2006.

¹⁵⁶ Lane Regional Air Protection Agency, www.lrapa.org/projects/everybody_wins/, 5 December 2006.

¹⁵⁷ West Coast Diesel, www.westcoastdiesel.org/programs.htm, 5 December 2006.

¹⁵⁸ Cascade Sierra Solutions, www.cascadesierrasolutions.org, 5 December 2006.

Programs to Reduce Driving

Many commuters are offered subsidized parking but get no comparable benefit if they use such alternative modes as walking, biking, telecommuting or public transit. When commuters are offered subsidized parking or its cash equivalent, automobile commuting trips typically decline 15-25%.¹⁵⁹ The result would not only include

significant reduction in emissions, but also a diminution in traffic accidents, congestion and fossil fuel consumption.

Parking cash out¹⁶⁰ means that commuters who are offered a subsidized parking space can instead choose the equivalent cash value or other benefits. For example, employees might be able to choose between a free parking space, a monthly transit pass, vanpool subsidies or \$50 cash per month. This typically reduces automobile commuting

by 10-30%, and is fairer, since it gives non-drivers benefits comparable to those offered motorists. More strategies to reduce driving for residents are discussed in the Chapter 5, Residential Transportation Section.

A study of 1,110 Los Angeles area employee commute trip reduction programs found that financial incentives were the most effective of all the strategies evaluated.¹⁶¹ The table below summarizes the findings.

Type of Benefit	Change in Drive Alone Mode Share
Bicycle Subsidy	-2.7
Vanpool Seat Subsidy	-5.4
Transit Subsidy	-3.1
Other Employee Benefits	-4.1

Table: Effect of Various Financial Incentives on Commute Trips

Transit voucher programs typically shift 20-percentage points of recipients' commute travel from auto to transit.^{162 163} Another study found that total vehicle trips declined by 17% after Parking Cash Out was

introduced at various urban and suburban worksites, as illustrated in the next figure.¹⁶⁴ These automobile trips reductions tend to increase over time: one employer found that solo

commuting continued to decline each year after Parking Cash Out was introduced, as more employees found opportunities to reduce their driving and take advantage of the benefit.

¹⁵⁹ Victoria Transportation Policy Institute www.vtpi.org/wwclimate.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/TransportationMunicipal/wwclimate.pdf, 27 September 2006

¹⁶⁰ Ibid.

¹⁶¹ Cambridge Systematics, *The Effects of Land Use and Travel Demand Management Strategies on Commuting Behavior*, Travel Model Improvement Program, USDOT (www.bts.gov/tmip), 1994.

¹⁶² Oram Associates, *Impact of the Bay Area Commuter Check Program: Results of 1994 Employee Survey*, Metropolitan Transportation Commission (Oakland; www.commutercheck.com), 1995.

¹⁶³ Judith Schwenk, *TransitChek in the New York City and Philadelphia Areas*, Volpe Transportation Systems Centre, USDOT (www.volpe.dot.gov), October 1995.

¹⁶⁴ Donald Shoup, "Evaluating the Effects of California's Parking Cash-out Law: Eight Case Studies," *Transport Policy*, Vol. 4, No. 4, 1997, pp. 201-216.

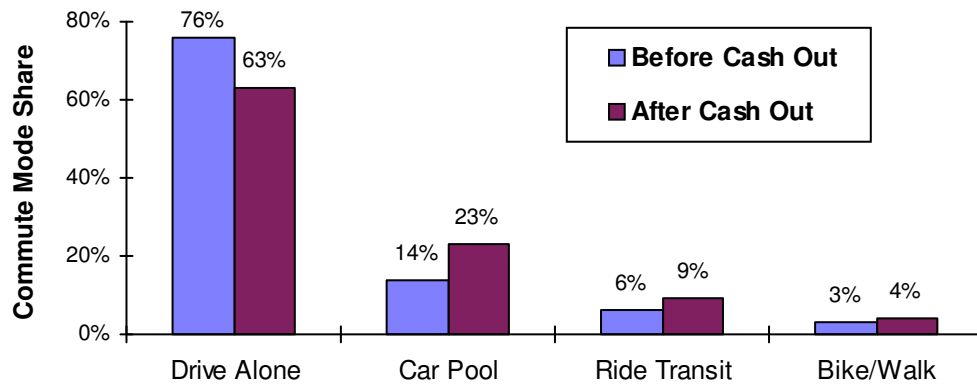


Figure: Cashing Out Impacts on Commute Mode¹⁶⁵

Parking Cash Out results in reduced automobile commuting and increases in carpooling, transit and non-motorized travel.

Municipal Fleet Emission Reduction

CASE STUDY: Oakland, CA

The city of Oakland established a Commuter Check Program¹⁶⁶ for employees. The program encourages the use of mass transit, by allowing employees to set aside pre-taxed dollars that are specifically designated for utilizing mass transit. The program encourages rider-ship

on buses, trains and ferries while lowering taxable earnings.

A monthly payroll deduction of \$100 plus an administrative fee is used to offset commuter expenses. Vouchers equaling the same set aside amount are

mailed to the employee and can then be used at various locations that dispense tickets and passes.

CONTACT

City of Oakland's Benefits Office
(510) 238-6560

Municipal Fleet Emission Reductions

CASE STUDY: Pleasanton, CA

The suburban city of Pleasanton, California offers \$1.50 per day to employees who use a commute alternative instead of driving to work alone. All city employees

are eligible to participate with no minimum days required. The program has resulted in an annual savings of 20,625 trips, which translates into 12,375 gallons of fuel and 123 tons of

CO₂. In 1993, the year before the program was implemented, only 28 employees were commuting to work using alternative modes. Average participation in 1994 was 55

¹⁶⁵ Ibid.

¹⁶⁶ Oakland Commuter Check Program, www.oaklandnet.com/government/fwaweb/site/personnel/personnel_benefitsp3.htm, 27 September 2006.

employees per month and grew to 66 participants in 1995.¹⁶⁷ By 2004 average participation was 57 employees per month representing a steady interest in the first ten years of operation. At the close of the 2006 fiscal year, average monthly

participation was up to 62 employees per month. The program has increased its incentive rate to \$2.00 per day.¹⁶⁸

The city of Pleasanton is also listed on the Best Workplaces for Commuters web site because of

their innovative programs to promote alternative commute programs.¹⁶⁹

CONTACT

Lisa Adomalis
City Economic Development
(925) 931-5039

Modify Transportation Contracts to Incentivize Alternative Fuel Use

Alternative Fuels for School Buses

There are many niche markets for biodiesel, but school buses, in particular, can be considered 'low hanging fruit'. The fact that there are about 460,000 school buses in the U.S.—nearly six times as many as all the nation's public transit buses combined—is reason enough. But the fact that children—especially young children—tend to be more susceptible than adults to the toxic and potentially cancer-causing emissions from petrodiesel has been an even

more compelling reason for school boards and parents across the nation to insist on switching school buses to biodiesel. program designed to help school districts clean up their bus fleets. The fact that the EPA received more than 120 applications requesting almost \$60 million is a clear indication of how popular the program has become. Numerous school districts have integrated biodiesel into their fleets¹⁷⁰:

In 1997 the Medford, New Jersey, school district was the only one in the nation to run its fleet on biodiesel¹⁷¹.

The Clark County, Nevada, school district now powers more than twelve hundred of its buses with biodiesel, making it the largest school bus fleet in the nation (and possibly the

world) to use biodiesel. The district school buses use 3.5 million gallons of biodiesel each year¹⁷²

In Kentucky nine school systems are now running six hundred buses on biodiesel.¹⁷³

Although the details are still a little confusing, there is increasing evidence that other school bus fleets are also saving money by using biodiesel, even though the fuel costs more than petrodiesel. How is this possible? Biodiesel use results in reduced maintenance costs and increased mileage per gallon.

The federal government has been helpful in this process. Congress included \$5 million in the Environmental Protection Agency's (EPA) budget for Clean School Bus USA,¹⁷⁴ a cost-shared grant

¹⁶⁷ Victoria Transportation Policy Institute, www.vtpi.org/tdm/tdm8.htm, 24 October 2006.

¹⁶⁸ Personal Communication with Lisa Adomalis, 27 October 2006.

¹⁶⁹ Best Workplace for Commuters, www.bwc.gov/empkit/case-studies.htm#city, 27 October 2006.

¹⁷⁰ "Biodiesel, Growing a New Energy Economy" by Greg Pahl, Chelsea Green Publishing Company, 2005.

¹⁷¹ National Biodiesel Board, www.biodiesel.org/resources/users/stories/medfordnj.shtm, 27 September 2006.

¹⁷² Clark County School District Insider, www.ccsd.net/news/publications/insider/05-06/Insider_Fall.pdf#search=%22biodiesel%22, 30 October 2006.

¹⁷³ For information on the six districts participating in Clean Cities pilot program: www.eere.energy.gov/afdc/apps/toolkit/pdfs/kentucky_success.pdf#search=%22school%20districts%20and%20biodiesel%22, 30 October 2006.

¹⁷⁴ EPA Clean School Bus www.epa.gov/cleanschoolbus/, 27 September 2006.

CASE STUDY: Saint Johns, MI¹⁷⁵

The Saint Johns Public Schools in Michigan was the first Michigan school district to switch its entire fleet of buses (totaling thirty-one) to B20 when it began utilizing biodiesel in 2002.

The school has kept careful maintenance records from both before and after biodiesel was adopted in April 2002. The main cost savings have been due to extended intervals between oil changes, according to Wayne Hettler, garage foreman and head mechanic for Saint Johns. "I'm convinced," he says, "that we are able to extend the oil changes because the B20 burns

cleaner and isn't dirtying the oil as quickly. We're using oil analysis to determine oil change times. We solely credit biodiesel for cleaning up the oil, thus saving the district the costs of oil, filters, labor and the like. I challenge other fleets to 'read' their fleet records and make these cost saving changes after switching to B20."

Longer fuel-pump life due to biodiesel's higher lubricity and increased miles-per-gallon rating are also cited by Hettler as adding even more savings. "Pre-April 2002, our fleet's mileage averaged 8.1 miles per gallon.

Now we average 8.8. That's a huge difference in miles per gallon for buses," said Hettler. A combined savings of \$3,500, even after the extra cost of the biodiesel is deducted, is predicted by the district for the two year period. If savings can be realized by this school bus fleet, it seems reasonable to assume that other fleets can do the same.

CONTACT

Garage Foreman, Head Mechanic
Wayne Hettler
(989) 227-5333.

CASE STUDY: Warwick, RI

On the East Coast, the Warwick, Rhode Island, school district not only uses B20 biodiesel in its entire seventy-bus fleet but has been successfully heating three of its school buildings with B20 since 2001.¹⁷⁶

Utilizing the change as an 'experiential education' opportunity the district has also begun integrating biodiesel education into its classroom curriculum. This program is modeled after the high school curriculum on alternative fuels

developed by the Northeast Sustainable Energy Association called "Cars of Tomorrow and the American Community."

In addition to switching fuels, Warwick Public Schools has undertaken a number of energy-saving initiatives. The district utilizes teaching tools that include a 5kWh solar array, a solar car and a fuel cell. According to Robert Cerio, who educates about and manages the energy program, these efforts combined with district-wide improvements

such as lighting retrofits and an energy management system—have resulted in annual energy savings of \$500,000 during the past four years, according to Cerio.¹⁷⁷

CONTACT

Energy Educator/ Manager
Robert Cerio
Warwick Public Schools
(401) 734-3219
cerior@wpsadmin.org

¹⁷⁵Michigan Soybean Committee <http://www.michigansoybean.org/>, 30 October 2006.

¹⁷⁶Rebuild America www.rebuild.gov, 27 September 2006.

¹⁷⁷Rebuild Warwick, www.rebuild.org/attachments/successstories/RhodeIslandBiodiesel.pdf#search=%22warwick%20public%20schools%2C%20energy%20management%20program%22, 30 October 2006.

Alternative Fuels for Waste Haulers¹⁷⁸

Waste haulers are one of the most inefficient vehicles on U.S. roads. They burn approximately a gallon of fuel for every 2.8 miles, travel approximately 25,000 miles annually and consume 8,900 gallons of diesel per year. The 136,000 refuse trucks operating on U.S. roadways may burn nearly 1.2 billion gallons of diesel fuel per year—equivalent to almost 30 million barrels of oil.

Alternative fuel sources are becoming more apparent and economically viable.

Greening Garbage Trucks, authored by James S. Cannon, documents changes since 2002:

Use of alternative fuel refuse trucks—nearly all powered by natural gas—has doubled from 692 to almost 1,500. The number of cities in which these trucks operate has also doubled, from 26 to 57.

Refuse trucks have become the most rapidly growing natural gas vehicle sector in the U.S. Their use has expanded more rapidly as a percentage than any other vehicle sector. Its 89% increase was four times the overall 20% increase

(between 2002 and 2004) in natural gas vehicle use nationwide.

New natural gas fleets have come into operation in Paris, Madrid and Mechlen, Belgium.

Although natural gas truck use has risen dramatically, the number now on U.S. roadways constitutes less than 1% of the total refuse truck population of 136,000. Even so, this sector is the second most promising market for natural gas vehicle use after the transit bus sector, which has a market penetration of 12%.

* The nation's five largest natural gas refuse truck fleets are operating in California.

City	Fleet Owner	Size of Fleet
Los Angeles, CA	City of Los Angeles	252 LNG
El Cajon (San Diego), CA	Waste Management-San Diego	126 LNG
Sacramento, CA	County of Sacramento	105 LNG (55 LNG/diesel, 50 LNG)
San Diego, CA	Environmental Services Dept.	77 dual-fuel LNG
Fresno, CA	City of Fresno	69 LNG

Table: Location of California Natural Gas Fleet Owners, Including Size of Fleet¹⁷⁹

U.S. fleet operators identified seven factors that encouraged their shift from diesel to natural gas fuel trucks and three major obstacles to change.

The seven positive factors were:

1. State government programs that provide incentives for purchasers of alternative fuel
2. Concern about rising gasoline and diesel prices, which have sparked fleet interest in alternatives to petroleum-based fuels
3. Looming new environmental standards for heavy-duty engines, which natural gas engine manufacturers are already prepared to meet
4. Growing concerns about national security and US dependence on foreign oil
5. Strong natural gas vehicle industry presence in the refuse truck market
6. Concern among urban leaders and health officials about the health effects of diesel exhaust, which contains carcinogens
7. Recognized benefits of less noise

¹⁷⁸ Greening Garbage Trucks, Trends in Alternative Fuel Use 2002-2005, James S. Canon. informinc.org/ggt_project1.php, also archived at www.climatemanual.org/Cities/Chapter5/BestBets/TransportationResidential/GGT_2005.pdf, 27 September 2006.

¹⁷⁹ Ibid.

The three primary obstacles to change were:

1. The higher costs of natural gas vehicles and their refueling infrastructure and the higher costs of biodiesel fuel
2. Performance issues that still affect natural gas trucks
3. Reduced federal funding for key DOE programs and a legal setback for the most ambitious

Transportation Contracts

CASE STUDY: Los Angeles, CA¹⁸⁰

The largest growth has occurred in the city of Los Angeles fleet, which grew from 10 natural gas trucks in 2002 to 252 in 2005. This increase occurred despite a serious setback in 2004, when the entire fleet of roughly 160 natural gas trucks was temporarily removed from service to repair the source of leaks in the liquefied natural gas (LNG) fueling system and to counter problems with overheating of the engines. (The trucks soon returned to service and have

performed well since then.) Leonard Walker, former Equipment Superintendent with the city of Los Angeles told INFORM that the city “bought natural gas trucks to improve the air quality. The City Council took a proactive position and voted to improve the air quality by supporting the SCAQMD (South Coast Air Quality Management District) ruling¹⁸¹ to purchase alternative fuel trucks before it was mandated by law.”

He noted that the fleet is “performing okay considering it is a new technology” and that “public support for the dual-fuel trucks is positive.”

CONTACT

LA Air Quality Division
heloise.froelich@lacity.org.

Other clean fuels and advanced technologies are emerging in refuse vehicles: use of biodiesel (San Jose, California), hydraulic hybrid technology (in Los

Angeles) and use of bio-methane fuel, a win-win strategy capturing a powerful GHG that was escaping from landfills for use as a clean renewable refuse truck

fuel (with projects in Burlington, New Jersey; Los Angeles & San Diego, California and Gothenburg, Sweden.)

¹⁸⁰ Ibid.

¹⁸¹ Rule 1193. Clean On-Road Residential and Commercial Refuse Collection Vehicles
www.aqmd.gov/tao/FleetRules/1193Refuse/index.htm, 27 September 2006.

CASE STUDY: Hybrid Technology¹⁸² for Refuse Vehicles

In late 2004, a developer of hydraulic-hybrid technology—Permo-Drive, Inc., based in Ballina, Australia—began a program to test its hydraulic-hybrid system in refuse collection vehicles operating in Los Angeles, California. For this test, Permo-Drive is collaborating with Waste Management, a major manufacturer of

truck chassis, a tier-one driveline systems integrator, and a refuse truck body builder. This team will build and test a hybrid-hydraulic refuse collection vehicle. In 2005, the Hybrid Truck Users Forum, a coalition of heavy-duty hybrid-electric truck developers, established a working group to promote the use of hybrid-electric

technology in refuse trucks. In 2006, the working group hopes to begin testing hybrid-electric refuse trucks.

CONTACT

Group Program Manager
Phil Condon
phil@permo-drive.com

CASE STUDY: Bio-Methane¹⁸³

A demonstration landfill gas recovery project, conducted in Burlington County, New Jersey, in 2004 and 2005, successfully produced excellent quality gas and used it to fuel two refuse trucks. In this project, landfill gas was purified using a proprietary CO₂ Wash system, developed by Acirion Technologies, Inc., which produced a contaminant-free stream of methane (75%) and carbon dioxide (CO₂) (25%). This methane-carbon dioxide stream was further separated

into high-purity methane (less than 100 parts per million CO₂) using membranes manufactured by Air Liquide. Additional processing liquefied the methane into high purity LNG truck fuel. The trucks were refueled with LNG at a Chart Industries fueling station located at the EcoComplex facility adjacent to the Burlington County landfill. The fuel powered two Mack trucks, with E7G engines, owned by Waste Management. Mack is now

focusing on selling this process commercially and is conducting free assessments for landfills to determine the economic feasibility of building landfill gas recovery facilities.

CONTACT

Mack Trucks
Government and Community Relations
Govt.comm.relations@macktrucks.com

¹⁸² Greening Garbage Trucks, Trends in Alternative Fuel Use 2002-2005, James S. Canon. informinc.org/ggt_project1.php, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/TransportationResidential/GGT_2005.pdf, 27 September 2006.

¹⁸³ Ibid.

Additional Resources

Hybrid Resources

- Hybrid Center provides information on consumer and technology
www.hybridcenter.org/
- Calculate the potential mileage savings for hybrid vehicles
www.fueleconomy.gov
- Clean Cities' HEV Cost Calculator allows fleets to compare the costs, benefits, and emissions of HEV with those of conventional vehicles
www.eere.energy.gov/cleancities/hev/cost_calc.html

Natural Resources Canada has developed ready-to-use graphic materials, articles, tools and templates that can help you organize a public education campaign at your workplace or develop a larger-scale awareness and outreach campaign in your community.
oee.rncan.gc.ca/communities-government/idling.cfm?attr=12

U.S. DOE Energy Efficiency and Renewable Energy Resources Clean Cities

Clean Cities develops comprehensive toolkits that help coalitions and stakeholders reach their petroleum displacement goals. With technical information, step-by-step instructions, answers to frequently asked questions,

related links, and more, Clean Cities' toolkits point users in the right direction. Choose the following toolkits to learn how to build niche markets, install alternative fuel infrastructure, and calculate the cost savings of hybrid electric vehicles.

www.eere.energy.gov/cleancities/
Alternative Fuels Data Center
www.eere.energy.gov/afdc/

Toolkits Available for Alternative Fuels

- www.eere.energy.gov/cleancities/toolkits.html
- Airport Shuttle Outreach Toolkit
www.eere.energy.gov/afdc/apps/toolkit/airport_shuttle_toolkit.html
- E85 Fleet Toolkit
www.eere.energy.gov/afdc/e85toolkit/
- School Bus Toolkit
www.eere.energy.gov/afdc/apps/toolkit/school_bus_toolkit.html
- Transit Bus Niche Market Toolkit
www.eere.energy.gov/afdc/apps/toolkit/transit_bus_toolkit.html
- HEV Cost Calculator
www.eere.energy.gov/cleancities/hev/cost_calc.html

National Biodiesel Board is the national trade association representing the biodiesel industry as the coordinating body for research and development in the United States
www.biodiesel.org

Chicago Locomotive Idle Reduction Project.

Environmental Protection Agency, March 2004.
www.epa.gov/smartway/documents/420r04003.pdf

Wisconsin Diesel Truck Idling Grant Program

www.legis.state.wi.us/lc/2/PUBLICATIONS/Other%20Publications/Reports%20By%20Subject/Environment%20and%20Natural%20Resources/IM05_02.pdf

Chicago districts' alternative fueled fleet success stories,
www.chicagocleancities.org/stories.shtml



**NATURAL
CAPITALISM
SOLUTIONS**

NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. BOX 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548



Chapter 5: Local Action Plan Best Bets Office Waste Reduction and Recycling

DOCUMENT CONTENTS

Office Practices to Reduce Waste	71
Reduce	72
Reuse	73
Recycle	73
Reduce Packaging	73
CASE STUDIES	
Miami, FL	74
New York, NY	75

Cities and municipalities can realize substantial economic savings simply by reducing the amount of office waste they generate. Reduced use, increased efficiency, recycling and the reuse of materials can deliver numerous economic and environmental benefits to cities. There are many forms of waste. This chapter focuses on office wastes, especially paper. Similar analyses can be made for all forms of municipal waste.

Office Practices to Reduce Waste¹⁸⁴

While recycling is an important part of reducing our impact on the environment, it is important to combine recycling with waste prevention programs to implement practices that reduce consumption and to reuse office

supplies. An enormous amount of waste is generated every year in offices due to inefficient use patterns. One of the first places to start is reducing paper use in offices:¹⁸⁵

The average office worker uses 10,000 sheets of copy paper each year. Producing and delivering that paper requires energy, whose use releases carbon.

The U.S. consumes 30% of the world's paper with 5% of the world's population.

Americans throw away enough office paper every year to build a 12-foot-high wall stretching from New York to San Francisco. When paper rots in a landfill, it releases methane gas, a far more potent greenhouse gas than carbon dioxide.

¹⁸⁴ For more information visit California Integrated Waste Management Board Waste Prevention and Recycling, www.ciwmb.ca.gov/WPW/Office/, 29 September 2006.

¹⁸⁵ Minnesota Office of Environmental Assistance, www.reduce.org/, 29 September 2006.

Increasing efficiency increases profits. First place an emphasis on reducing use, then on reducing waste and finally recycling the waste that is still generated. Cities should start with the concepts and practices that staff are most familiar with, and are thus more likely to rapidly embrace. Do what is easiest to get staff started, but recognize that even the easy things require a commitment to making changes in daily habits.

Reduce

Here are some simple ways to significantly reduce paper waste.

Set photocopiers and printers to print on both sides by default. If this is not possible, save paper that can be used on the second side, and reuse it.

Make computer files instead of paper files whenever possible.

There are many free or inexpensive software programs, such as Stickies¹⁸⁶ or NoteWhen¹⁸⁷ that reduce or eliminate the need for sticky notes and note pads. Small handheld computers are especially good for note taking, calendar scheduling, and other tasks that traditionally use paper. With recent advances in computer software, it is now easier than ever to create documents that are encrypted, password protected, and safe from either unauthorized access or alteration using sophisticated free and low cost software. Electronic signatures are increasingly becoming accepted and are legally binding.

Electronic files also save floor and file space, and most electronic documents are safer than paper. Backup copies can be easily transferred to high-capacity, low-cost removable media, such as compact discs or removable hard drives and stored off-site. Backups can also be transferred over secure Internet connections for off-site storage. Offices are then safer from fire or flood and theft.

Fight junk mail—Take steps to reduce the amount of junk mail that offices receive. While this may take a little staff time at first, in the end staff time will be saved by not having to weed out the junk, fewer trees will be lost to produce the paper, less fuel will be used in the production and sale of the paper not to mention the saved printing and delivery costs.

- Remove Your Business From Two Major Mailing List Databases:

1. Dun & Bradstreet (D&B) maintains the largest company database worldwide, collecting information on more than 70 million business establishments from 217 countries. An authorized representative of the business can request the "delisting" process orally or in writing, resulting in its removal from marketing directories, publications and/or mailing lists. To have your business delisted, call D&B's customer service center at 1-800-333-0505 or send an e-mail to custserv@dnb.com.

2. InfoUSA maintains information on more than 12 million businesses in the U.S. To remove your business from their lists, fax a letter to (402) 331-0176 with: "Attention—Business Update Department" on top. The letter should include the complete business name, address, and phone number; the name and title of the person requesting the deletion; and that person's signature. You can also send this letter by regular mail to InfoUSA, P.O. Box 27347, Omaha, NE, 68127.

- Remove Your Business from Specific Company Mailing Lists:
Not every company uses the mailing list databases maintained by Dun & Bradstreet and InfoUSA. You can either establish a system where one person is designated to contact individual, persistent mail solicitors or encourage all your employees to contact mail solicitors. You can create a preprinted postcard to make it easier for employees to contact solicitors, thus increasing the likelihood that they will. When sending a mailing list deletion request card, be sure to write "Attn: Direct Marketing Dept." under the company address. Even if the company does not have a separate direct marketing department, this will help the card be delivered to an individual within the company who can delete your name from their mailing list.

¹⁸⁶ Zhorn Stickies, www.zhornsoftware.co.uk/stickies/index.html, 29 September 2006.

¹⁸⁷ PC Magazine Article, www.pcmag.com/article2/0,1759,1559699,00.asp, 29 September 2006.

- If a company continues to send unwanted mail, report the persistent offender to the National Waste Prevention Coalition's "Business Junk Mail Complaint Bureau." If the bureau receives several complaints about a particular company, it will notify that company.¹⁸⁸
- The Federal Trade Commission website on unsolicited mail gives direction on how to remove yourself from unwanted mail.¹⁸⁹ The Direct Marketing Association Mail Preference Service also gives people a way to opt out of junk mail.¹⁹⁰ The Center for a New American Dream provides a free Junk Mail Organizers Kit.¹⁹¹

Reuse

Reuse envelopes to send mail whenever possible.

Use labels to cover the old address on used envelopes. Some companies sell reuse labels¹⁹² for envelopes, which have a discrete message at the bottom explaining that this envelope was reused to save trees.

Have each staff set aside paper that they use on only one side

so that it can be reused for printing drafts in your printer, or stapled together to make scratch pads. As employees accumulate paper, they can transfer it to a storage box near a printer or photocopier.

Recycle

Start a recycling program

Determine which material you want to recycle, find someone to pick up the material (for example Yellow Pages directories generally have recycling vendors who will pick up old directories), put recycling bins around your office, and get staff to participate. Having management participate is important to creating a successful recycling program.¹⁹³ Look under headings such as recycling, refuse, waste disposal for local programs.

Reduce Packaging

Select products from suppliers and manufactures that use minimal packaging.

Reuse packing material whenever possible¹⁹⁴

Spread the word. A good example is the best motivator, and you might help persuade local residents and businesses to practice waste prevention. Eliminating excess packaging in one Wal-Mart product line saved the company \$2.4 million a year and 1 million barrels of oil in shipping.

¹⁸⁸ Contact Tom Watson, Coordinator, National Waste Prevention Coalition. Phone: (206) 296-4481, tom.watson@metrokc.gov.

¹⁸⁹ Federal Trade Commission, Consumer Alert, www.ftc.gov/bcp/edu/pubs/consumer/alerts/alt063.htm, 7 January 2007.

¹⁹⁰ P.O. Box 9008, Farmingdale NY 11735-9008.

¹⁹¹ The Center for a New American Dream, www.newdream.org/cnad/user/junkmail_kit.php?params=bf76072cf86a5bb1396c012786c1028d, 7 January 2007.

¹⁹² Northern Sun, Save A Tree Labels. www.northernsun.com/cgi-bin/ns/2032.html, 29 September 2006.

¹⁹³ For a more thorough explanation of how to begin a recycling program visit: www.ciwmb.ca.gov/BizWaste/OfficePaper/Campaign.htm, 29 September 2006.

¹⁹⁴ CIWMB, Packaging Waste Reduction. www.ciwmb.ca.gov/Packaging/, 29 September 2006.

CASE STUDY: Miami, FL

The management of paper related to hundreds of thousands of traffic cases filed in Miami-Dade County each year is a monumental challenge. The Clerk's Office and the Court have progressed from simple manual procedures to highly complex automated processing systems. Demands for greater efficiency and capacity in managing the never-ending flow of these documents encouraged new and creative ways to manage these court records. The SPIRIT (Simultaneous Paperless Image Retrieval Information Technology) Project,¹⁹⁵ a technology-based information system developed for the Traffic Division of Miami-Dade County, was launched in 1995. Accenture¹⁹⁶ developed the SPIRIT software program for the Miami-Dade County. Projects were initiated to provide improved service to the various agencies that process traffic cases, attorneys and the public.

The SPIRIT Project addresses every aspect of the traffic court process, from scheduling traffic

cases, scanning documents, front counter processing, public viewing, the judge's workbench and end of session processing. All are handled by a specially designed software system that dramatically reduces the amount of paper used in court and cuts down the number of clerks needed. Some of the benefits of SPIRIT include:

Over a 5-year period, the Clerk's Traffic Division reduced the number of full time positions by 40 and transferred excess employees to the budget office and other vacant position within the Clerk's Office.

The Clerk's Traffic division is now handling and processing 32% more citations than in 1995, with a 167% increase in infraction cases scheduled for court, all with 15% less staff.

The Traffic Division's use of SPIRIT reduced overtime from a high of \$412,649 for the fiscal year 1996-97 to a projected low of \$150,000 in 2001-02.

An improved system for setting schedules has led to a significant reduction in police officer court overtime and increased officers' hours on the street.

The error rate of data entry has been reduced from 15% to less than 1%.

All traffic clerks have access to SPIRIT case files simultaneously allowing, totally decentralized service to the public at all district locations.

CONTACT

Chief Information Officer
Tom James
Clerk of Courts
jamestg@miami-dadeclerk.com

Senior Deputy
Ricky Schechtman
Clerk of Courts
sch@miami-dadeclerk.com

¹⁹⁵ Clerk of Courts, 11th Judicial Circuit of Florida, Miami-Dade County, www.miami-dadeclerk.com/dadecoc/SPIRIT.asp#SPIRIT_System_Overview, 29 September 2006.

¹⁹⁶ Accenture website, www.accenture.com, 29 September 2006.

CASE STUDY: New York, NY

New York City Department of Environmental Protection (DEP) WasteLe\$\$ Program¹⁹⁷ is the city's waste prevention and recycling resource for home, agencies and school, and businesses.

The NYC DEP made some simple changes in its office practices that reduced the amount of waste it produced and produced cost savings. The DEP made four changes: double-sided all copies, refurbishing printer toner cartridges, substituting electronic for paper telephone directories, and streamlining letterhead format.

The reproduction shop at the DEP makes all copies double-sided except when a single-sided copy is specifically requested. The number of double-sided copy jobs has risen to 92%, saving an

estimated 5,520,000 sheets of paper every year, or about \$26,000.¹⁹⁸

As part of the NYC City Sen\$e Project, the DEP LeFrak City offices initiated a program to collect and return toner printer cartridges to the manufacturers for refurbishing or recycling. In addition, DEP plans to purchase refurbished toner cartridges through its purchasing agents.¹⁹⁹

The DEP implemented a program to update, produce and disseminate its internal telephone directory electronically. Before the program began, DEP printed 2,500 telephone directories annually. Switching to electronic phone directories reduced annual paper use by 1.29 tons and saved around \$14,800.

Since the DEP has 14 Deputy Commissioners and 12 regional headquarters, the letterhead needs of the Agency are constantly changing. DEP developed a standardized format for letterhead that includes DEP's logo and the Commissioner's name and provided individual computer templates for each office. The new letterhead system allows DEP staff to personalize and print letterhead on demand and eliminates the need to replace pre-printed letterhead with each new staff appointment.

CONTACT

Department of Environmental Protection, Customer Service
(212) 639-9675



**NATURAL
CAPITALISM
SOLUTIONS**

**NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. BOX 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548**

¹⁹⁷ NYCWasteLe\$\$ Program. www.nyc.gov/html/nycwasteless/html/at_agencies/govt_case_studies_waste.shtml, 29 September 2006.

¹⁹⁸ To calculate the waste prevention benefits and cost savings of duplex copying visit: www.nyc.gov/html/nycwasteless/html/at_agencies/measurement_tools_copying.shtml, 29 September 2006.

¹⁹⁹ To calculate the waste prevention benefits and cost savings associated with establishing a toner-cartridge recycling program visit: www.nyc.gov/html/nycwasteless/html/at_agencies/measurement_tools_toner.shtml, 29 September 2006.

Chapter 5: Local Action Plan Best Bets Municipal Purchasing Programs

DOCUMENT CONTENTS

Energy Efficient Standards for Municipal Office Equipment	77
CASE STUDIES	
New York City, NY	78
Washington, D.C.	79
Recycled/Salvage Product Use Policies.....	79
Architectural Salvage and Deconstruction	79
CASE STUDIES	
Davis, CA.....	80
San Jose, CA.....	80
Establish Local Purchasing Programs	81
CASE STUDIES	
Philadelphia, PA	82
Portland, ME.....	82
Santa Fe, NM	82
Additional Resources	83

The purchasing decisions that municipal offices make can have a substantial impact on the overall environmental impact of the office while serving as an example to the community. Purchasing “green” or more environmentally friendly products can also support local vendors, and often helps recycling programs by creating markets for the collected materials that are processed and used to manufacture new products. In turn, this creates new jobs and helps strengthen the economy. It conserves natural resources, saves energy, and reduces solid waste, air, and water pollutants, and greenhouse gases that contribute to global warming.

In 2002, the U.S. spent around \$50 billion on office supplies—a

huge potential market for green products. The magnitude also means that there are ample opportunities for cost savings. Just sending printers and copying cartridges for remanufacturing could save U.S. offices \$1.5 billion and at least 100,000 barrels of oil annually.²⁰⁰ Yet despite the fact that two-thirds of U.S. businesses have policies on recycling, only 40% have policies regarding the purchase of recycled materials.

Recommendations for making a green purchasing program a success.²⁰¹

Evaluate each recycled or environmentally preferable product to determine the extent to which the product may be used in practice by the agency and its contractors.

²⁰⁰ Green Seal's Choose Green Report, seattle.gov/environment/Documents/GreenSealOfficeSupplies_finalCE.pdf, 29 September 2006.

²⁰¹ King County Environmental Purchasing Program, Model Environmentally Preferable Products Policy. Feb. 2004.
www.metrokc.gov/procure/green/mdpolicy.htm, 27 September 2006.

Purchase recycled products with the best balance of recycled material and cost.

Ensure contracts that the office issues require recycled and environmentally preferable products whenever possible.

Ensure contracts for recycled products require that contractors provide certification of this content and report the amounts used.

Ensure that all printing by city agencies uses recycled paper and bears the chasing arrow logo or other imprint identifying it as such.

Use both sides of paper sheets whenever practicable in printing and copying. See Chapter 5 Waste Reduction Section.

Ensure that requests for bids and proposals issued by the city require that contractors and consultants use recycled paper and both sides of paper sheets whenever possible.

Report total purchases of environmentally preferable, recycled, and non-recycled products by the agency and its contractors annually to the climate protection agency.

Promote the use of recycled and other environmentally preferable products by publicizing and educating others about the procurement program.

Energy Efficient Standards for Municipal Office Equipment

ENERGY STAR® was introduced in 1992 by the U.S. Environmental Protection Agency (EPA) as a voluntary labeling program designed to identify and promote energy efficient products to save energy and reduce GHG emissions. Computers and monitors were the first labeled products. Through 1995, EPA expanded the label to additional office equipment products and residential heating and cooling equipment. In 1996, EPA partnered with the U.S. Department of Energy for particular product categories.

The ENERGY STAR® label is now on major appliances, office equipment, lighting, home electronics and much more. EPA has also extended the label to cover new homes and commercial and industrial buildings. Overall, ENERGY STAR® office products use about 50% less energy than standard office equipment.²⁰²

ENERGY STAR® has partnerships with more than 8,000 private and public sector organizations, and so delivers the technical information and tools that organizations and consumers need to choose energy-efficient solutions and best management practices. ENERGY STAR®

has successfully delivered energy and cost savings across the country, saving businesses, organizations and consumers about \$12 billion in 2005 alone—while saving enough energy to avoid annual greenhouse gas emissions equivalent to those from 23 million cars.²⁰³

The ENERGY STAR® website is a good source of information on every product available containing the ENERGY STAR® label. The site can identify the best ways to reduce total energy costs using ENERGY STAR® products.

²⁰² ENERGY STAR® website, www.energystar.gov/index.cfm?c=ofc_equip.pr_office_equipment, 27 September 2006.

²⁰³ Ibid.

CASE STUDY: New York City, NY

In 2003, Mayor Bloomberg of New York City put into code the city's energy efficient purchasing practices that have been in use since 1994. Local Law No. 30 requires that all energy-using devices purchased by the city of New York be ENERGY STAR® labeled, providing that there are at least six manufacturers producing ENERGY STAR® products. During the fiscal year of 2002, NYC spent \$90.8 million on ENERGY STAR® products, most of which went to purchasing computer related products such as CPU's, printers and monitors.²⁰⁴ Jennifer Blum, of NYC's Department of Citywide Administrative Services said of the program, "New York City firmly believes that in our role as a market participant we should

promote the purchase of energy-efficient products."

Indeed, New York's adoption of an exclusive ENERGY STAR® purchasing program sends a very strong message to appliance vendors and manufacturers that major purchasers are now opting for more efficient technology. The market is forcing manufacturers to comply, or risk losing business to more efficient competitors. New York City is a major player in reaching the tipping point for increased standardized efficiency in appliances.

While the program itself comes at zero cost, there may be slightly higher up front costs associated with more efficient appliances

(although not always the case). Yet a net savings can be expected over time associated with the significantly decreased energy use.

In 2005, the city passed Local Law 119, which is a more expansive and stringent version of Local Law No. 30.

CONTACT

Assistant Director & Special Counsel for Environmental Procurement

Russ Unger
NYC Mayor's Office of Contract Services
(212) 788-0060
RUnger@cityhall.nyc.gov

²⁰⁴ Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division Newsletter. eetdnews.lbl.gov/nl16/estar.html, 27 September 2006.

CASE STUDY: Washington, D.C.

The municipal government of the District of Columbia passed the ENERGY STAR® Efficiency Amendment Act in 2004, requiring city officials to buy only ENERGY STAR® rated products for energy consuming devices.

The bill states that,

In any solicitation by an agency for the purchase or lease of energy-using products, the agency shall include a specification that the products be ENERGY STAR® labeled; provided, that there are at least 3 manufacturers that produce products with the ENERGY STAR® label,

and that there are at least 3 responsible vendors offering ENERGY STAR® labeled products.²⁰⁵

This program greatly resembles NYC's ENERGY STAR® legislation in that while reducing energy use within the city, it also takes advantage of D.C.'s high profile status to create positive publicity for purchasing of energy efficient products. Since the legislation was introduced, the DC Energy Office has scheduled several training sessions, offered by the EPA, for government officials to help them implement ENERGY STAR® purchasing District-wide.

The city's procurement ENERGY STAR® operation is currently self-regulating, but the Energy Office is working on putting enforcement mechanisms in place to hold city government offices accountable for their purchasing decisions.

CONTACT

Chief, Environmental Sustainable Solutions Division

Tomaysa Sterling
Energy Office
Washington, D.C.
(202) 671-1405.

Recycled/Salvage Product Use Policies

Creating city policies that encourage or require the use of recycled products in city operations can reduce costs and serve as a good example to the community. However, it is also important to focus on how those products are used once they are purchased and how they are discarded when no longer needed.

Many office products, such as computers, printers and other electronic equipment can be recycled or refurbished for reuse. PCDisposal.com and other similar companies offer services such as direct pickup, erasing data from hard-drives, profit

sharing from equipment resale, preparation for donation and online employee purchasing programs. Some computer manufacturers, Dell for example, will agree to take back and recycle used units for a small fee. When negotiating contracts, departments making large equipment purchases can require that the computer manufacturer take back the used equipment for recycling at the end of its life free of charge.

Architectural Salvage and Deconstruction

Architectural deconstruction is the systematic dismantling and reuse of part or all of a building. Reusable and recyclable materials are removed before the building is demolished. Doing

this prevents large amounts of waste from ending up in a landfill. In addition to significantly reducing waste, in some communities, salvaged materials can be donated to a non-profit organization²⁰⁶. Such a tax deduction will offset the cost of recovering the materials making the process comparable to the cost of demolition and can earn points towards LEED™ certification.

The Canadian company i-wasteNot makes and operates community waste exchanges in the City of Chicago, California, Colorado, Georgia, Washington, Wisconsin, Massachusetts, British Columbia, Alberta and Ontario. Such exchanges prevent waste from reaching the landfill, creates jobs and new products instead of trash. Their

²⁰⁵ www.energystar.gov/index.cfm?c=government.local_gov_news, 27 September 2006.

²⁰⁶ ReSource, www.resourceyard.org. To contact call 303-419-5427 or e-mail decon@resourceyard.org.

online waste exchanges for residential, industrial and construction demolition waste facilitate the sale or donation of good used items and material for reuse and recycling. They bundle these waste exchanges within green community websites where requested, so that other tools like Green Business Directories, Green Events and Calendars, Reuse and Recycling

Directories are available to citizen.²⁰⁷

Implementing a city policy of purchasing salvaged products whenever possible, and sending used office equipment to a non-profit salvage company instead of sending it to the landfill can stimulate local business and create new jobs by creating a

market for and supplier of salvaged goods. The city of Portland developed a Furniture Surplus program where city employees can post and view surplus furniture so that it may be reused by another bureau. The program reduces waste and saves costs associated with procuring new supplies as well as disposal and recycling fees.²⁰⁸

Recycled/ Salvaged Products

CASE STUDY: Davis, CA

In 1997, the city of Davis, California adopted a municipal code that mandates city purchasing of recycled products. The codes require that the city purchase recycled material with the highest possible recycled content whenever possible. City departments must implement strategies to maximize their purchasing and use of recycled materials, equipment and machinery. In addition, departments must promote the use of products made from recovered materials and label products to indicate that they are recycled. The city also agreed to

stimulate the market for recycled goods through cooperation with neighboring agencies.

Davis' procurement strategy has diverted an impressive 50% of its waste-stream away from the landfill.²⁰⁹ Annual reports must be prepared by the various departments to catalogue the types and amount of recycled content purchased as well as the overall cost of these purchases. The mandates also require that no virgin materials be required in any products for city purchasing.²¹⁰

CONTACT

Senior Utility Resource Specialist
Richard Tsai
(530) 757-5671
rtsai@ci.davis.ca.us

Conservation Coordinator
Jennifer Franceschine
(530) 757-7559
jfranceschine@ci.davis.ca.us

Recycled/ Salvaged Products

CASE STUDY: San Jose, CA

The city of San Jose is a pioneering leader in municipal recycling programs with a curbside pickup program serving over 165,000 residents. The city recognized, however, that just

collecting neatly separated trash in bins is not quite enough to close the recycling loop.

San Jose city officials decided to create a market for the products

produced from recycling by creating the Buy Recycled program in 1990. San Jose now purchases over 40 types of recycled content products. More recently, in September 2001, the

²⁰⁷ iWasteNot Systems, www.i-wastenot.com/site/, 15 January 2007.

²⁰⁸ City of Portland, Office of Sustainable Development, www.portlandonline.com/osd/index.cfm?a=117682&c=42401, 27 September 2006.

²⁰⁹ New Renaissance, Vol 11, No.3, www.ru.org/113-Davis-California.htm, 27 September 2006.

²¹⁰ Davis Municipal Code, www.city.davis.ca.us/cmo/citycode/detail.cfm?p=15&q=473, 27 September 2006.

city council adopted a policy that addresses Environmentally Preferable Purchasing (EPP).

Within city offices, everything from copy paper to printer paper, as well as post it notes and folders contain post-consumer waste. Janitorial products such as paper towels and trash bags are made of recycled material, as is the compost used in city parks. All paper products and printing done through contracts outside of the city is mandated to be on

recycled paper. The city has set a standard of using up to 95% recycled material for street signs, as well as refurbished aluminum.

San Jose's vehicular fleet maintenance crew utilizes recycled oil and antifreeze products in its fleet. At first this was a tough sell, but the recycled automotive products have greatly exceeded the crew's expectations. They now prefer the recycled oil because it burns better and runs cleaner.

The city saves around \$10,000 every year through purchasing of recycled products, and reaps unquantifiable environmental benefits.

CONTACT

Committee Member
Gay Gale
EPP Steering
(408) 535-7054
Gay.Gale@sanjoseca.gov

Establish Local Purchasing Programs

Local purchasing programs are programs that prioritize patronizing local businesses before buying from “absentee” owners or large, distant corporations²¹¹. Buying locally reduces transportation costs and emissions of purchased goods and can also stimulate and support the local economy by supporting local businesses and jobs. In addition, people are increasingly likely to invest in or move to communities that preserve the culture embodied in its unique businesses. Buy-local programs are a good investment for a community's future because three times more money stays in the local economy when goods and services are bought from

locally owned businesses instead of large chain stores.²¹²

Cities can adopt a city procurement policy of buying from locals before non-local businesses and can also create a local first campaign where the city encourages the community as a whole to buy from local businesses.

Local city procurement policies are sometimes difficult to implement, especially for smaller cities without a large industrial sector. Combining a buy-local procurement policy with a buy-green procurement policy can become complicated and costly.

However, by making a conscious effort to look for local products before making purchasing decisions, cities can reduce the carbon footprint of purchases and

boost their local economies with relatively little effort.

The advantage of a local first campaign is that it has a low cost to the city government and improves the local government's interaction with the community. Many such campaigns are organized by the local businesses themselves with the government playing a partnering role. Campaigns can consist of everything from rallies, public events, distribution of literature, stickers or placards placed in windows to designated local businesses, media coverage, websites with relevant information and much more. The success of a campaign largely depends on the effectiveness of its outreach to the community, so the more creative it is, the more likely it is to gain community involvement.

²¹¹ BALLE, Business Alliance for Local Living Economies. www.livingeconomies.org/localfirst/whylocalfirst/, 27 September 2006.

²¹² Buy Local Philly website, www.buylocalphilly.com/, 27 September 2006.

Local Purchasing

CASE STUDY: Philadelphia, PA²¹³

Philadelphia's Buy Local program is an excellent example of a city program to promote patronage of independent local businesses. For every \$100 spent on local businesses, \$45 goes back into

the local economy, as opposed to only \$14 for a non-locally owned business. The website for the Buy Local program includes information regarding local businesses, a comprehensive directory of registered local

businesses as well as information on how to register your business.

CONTACT
(215) 386-5211
info@buylocalphilly.com

Local Purchasing

CASE STUDY: Portland, ME²¹⁴

Portland, Maine's, local purchasing program went into effect in the summer of 2006. For a \$20 membership fee, qualifying businesses (the business must be registered in Portland, and the owners must live locally) can obtain a window decal and poster to be displayed at their business that reads "Buy Local: Keep Portland

Independent". The fees also go toward maintaining the website, administrative costs and local media advertising. The Portland Buy Local campaign is a non-profit group led by a coalition of local business owners, pro-business organizations, city officials, and consumer activists. The city of

Portland marketing and economic development staff has helped guide and support this effort. As of 2006, the Buy Local campaign has around 160 participating local businesses.

CONTACT
info@portlandbuylocal.org

Local Purchasing

CASE STUDY: Santa Fe, NM

The Santa Fe Alliance²¹⁵ is a locally run program dedicated to building an alliance between local businesses, non-profits, government and community members. The Alliance has a commitment to educating the people of Santa Fe on the benefits of supporting locally run and owned businesses.

Local businesses and non profits that chose to sign on to the program with a minimum donation of \$100 for a business and \$30 for a non-profit benefit through a link on the website to their business as well as publicity in Alliance newspaper advertisements and educational

information. As of 2006, the Santa Fe Alliance has over 700 participating local businesses.

CONTACT
Santa Fe Alliance
(505) 989-5362
info@santafealliance.com

²¹³ Ibid.

²¹⁴ Portland Buy Local Campaign, www.portlandbuylocal.org/index.html, 27 September 2006.

²¹⁵ Santa Fe Alliance, www.santafealliance.com, 27 September 2006.

Additional Resources

Other websites dedicated to building strong local economies through uniting local businesses and educating citizens on the benefits of local purchasing include:

The American Independent Business Alliance

www.amiba.net/

Business Alliance for Local Living Economies (BALLE)

www.livingeconomies.org

Local Town USA.COM

www.localtownusa.com

Institute for Local Self-Reliance

www.ilsr.org

The following is a list of some office products with green alternatives:²¹⁶

- Highlighters, Markers, Correction Fluid: Buy non-toxic, water-based. Conventional aromatic solvent and alcohol-based contain toxic materials. Choose refillable markers if available.
- Clipboards: Buy recycled. Clipboards made of 100 percent post-consumer plastic are now available.
- Paper-based Office Products: Buy recycled, chlorine-free. Paper manufacture using virgin pulp consumes trees and is highly water intensive, energy intensive, and polluting.
- Binders and Folders: Binders made from 100% post-consumer recycled cardboard and 100% post-consumer recycled PET (from soft drink bottles) are available.
- Self-Stick Notes: Buy 100% recycled or use electronic programs like Stickies²¹⁷
- Envelopes: Buy unbleached, light-weight and recycled. FedEx and other shippers use envelopes made of Tyvek because of their lighter weight and strength. The lighter weight translates directly into fuel savings, particularly in the case of long-distance shipments. Tyvek also incorporates 25% post-consumer recycled content from plastic milk and water jugs, and the used envelopes are recyclable.
- Pens and Pencils: Buy refillable pens, and pens made from recycled materials. Buy pencils made from recycled materials, such as lunch trays and shredded dollar bills.
- Toner Cartridges: Remanufactured cartridges can be obtained at roughly half the price of a new one while significantly reducing the environmental impact of discarding cartridges.
- Presentation Transparencies: Buy at least 50% total recycled content with at least 25% post-consumer recycled content.
- Slag cement (95% less CO₂ emitted than regular cement)
- 80 PLUS computer power supplies for PCs and servers

- Bio-based lubricants, etc. (fleet uses)

The Federal Energy Management Program (FEMP)

FEMP criteria and the federal ENERGY STAR® energy efficiency labeling program identify efficient products, helping agencies “buy efficient”, often as part of an agency’s broader policy to “buy green”.
eetdnews.lbl.gov/nl16/estar.html

City of Berkeley Resolution to adopt an Environmental Preferable Purchasing Policy.

A portion of the resolution states: Policy requires purchase of products and services that minimize environmental and health impacts, toxics, pollution, and hazards to workers and community safety and to the larger global community to the greatest extent practicable

Specifications are described for Source Reduction, Toxics Reduction and Pollution Prevention, Recycled Content products, Energy and Water Savings, Green Building Construction and Renovation, Landscaping, Forest Conservation, and Agricultural and Bio-based products.
www.ci.berkeley.ca.us/sustainable/government/101904.EPPPpolicy.pdf

²¹⁶ Ibid.

²¹⁷ www.zhornsoftware.co.uk/stickies/index.html, 29 September 2006.

California Integrated Waste Management Board

For a directory of companies that meet or exceed these standards, please visit the California Integrated Waste Management Board's website²¹⁸: A good deal of information can also be found on the best ways to reduce, reuse, recycle, and where to purchase recycled office supplies in this document hosted by Seattle's municipal website.²¹⁹

EPA Report: Promoting Green Purchasing

EPA's Environmentally Preferable Purchasing (EPP) Program has announced the availability of a new document entitled "Promoting Green Purchasing: Tools and Resources to Quantify the Benefits of Environmentally Preferable Purchasing." This compilation of tools and resources will be useful to any organization trying to estimate the environmental and economic benefits of both past and projected EPP choices. www.epa.gov/epp/tools/epp_metrics.pdf



NATURAL CAPITALISMS SOLUTIONS IS A 501(c)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548

²¹⁸ www.ciwmb.ca.gov/RCP/Product.asp?VW=CAT&CATID=264, 27 September 2006.

²¹⁹ seattle.gov/environment/Documents/GreenSealOfficeSupplies_finalCE.pdf, May 2002.

Chapter 5: Local Action Plan Best Bets Utilities

DOCUMENT CONTENTS

Encourage Utility Providers to Offer Energy Efficiency Services.....	85
Case Study: SCORE Pilot Program, TX	87
Encourage Utility Providers to Set a Minimum Commodity from Renewable Energy Purchases.....	88
CASE STUDIES:	
Newark, DE	89
Boulder, CO	89
Radnor Township, PA.....	90
Los Angeles, CA.....	91
Lenox, IA	92
Additional Resources	93

Encourage Utility Providers to Offer Energy Efficiency Services

Cities typically obtain their electric and gas services either from municipal utilities or under contract from utilities that provide power to a much wider service territory. A few cities still derive their power from Rural Electric Co-ops.

Many of the best efficiency programs in the nation have come from municipally owned utilities. The programs profiled elsewhere in this manual of Osage, Iowa, Seattle City Light, Sacramento, California, and Burlington, Vermont are representative of the sorts of programs that a “muni” can offer. The difference between the efficiency programs offered by munis and those of “Investor owned utilities” has been so stark that many citizens have begun efforts to municipalize their

service territory.²²⁰

But in truth, the privately held utilities can offer excellent efficiency and renewables programs, as well. In the 1980’s Southern California Edison found it cost effective to give away over a million compact fluorescent light bulbs. The energy saved this way was cheaper than just running SCE’s existing power plants. Utilities like Burlington Electric lease efficient light bulbs to their customers for pennies a month and give free replacements. Not only does this keep the bulbs from being thrown away, it enables customers to pay for the efficiency over time.

Burlington’s Smartlight program has 65,000 bulbs in circulation serving over 7,000 homes, achieving an annual savings of over \$390,000.

For many years it was believed that it was in the financial interest of utilities to build more power plants. Indeed, until the early 1970’s every new plant

²²⁰ In recent years activists from San Francisco, Berkeley, CA, Eugene OR, Boulder CO, Enid OK, Las Cruces NM, DeKalb, Hermon, Lisbon, Potsdam, and Russell, New York, and hundreds of other town have pressed for their city to take over the delivery of electric service. Some succeeded, others decided to stay with the private utility, www.local.org/gatekeep.html, 30 November 2006.

lowered costs for everyone in the system. Utility regulations were structured to reward building more plants, customers were urged to buy “All Electric Homes” and incentives were given to use more electricity. For a variety of reasons, this is no longer true: every new plant that is added to a system raises every customer’s rates, and has for almost 30 years. In many states, however, utilities are still rewarded for building more plants.²²¹

Various states have experimented with regulations to encourage utilities to meet customers’ needs in the cheapest way. Programs like Integrated Resource Planning, which require utilities to compare the cost of building new capacity with the cost of doing the same job of meeting customers’ needs through energy efficiency, sought to level the playing field.²²² Every competent analysis has shown that efficiency costs far less than new supply. For example, good efficiency programs, to, say, retrofit light bulbs, cost about 1 - 2¢ per kilowatt hour saved, while just running a coal plant costs 4 – 5 ¢. New wind, in good sites can cost as low as 3¢. Running an existing gas plant typically costs 5 – 6¢. The average price of electricity from the grid is at least 8¢ per kilowatt hour, and building a new nuclear plant can cost as much as 20¢. And these numbers do not count the cost of emitting carbon and threatening the climate.

Obviously, it is in everyone’s interests to pursue efficiency first, but few utility programs achieve this outcome. Until recently, utilities have tended to pursue only as much efficiency as regulators require them to. Only a few jurisdictions decoupled sales of electricity from utility profits, so utilities will no longer be rewarded for selling more electricity nor penalized for selling less.

There have been some notable exceptions. In California in the late 1980’s, the Public Utility Commission shifted its regulations to reward utilities with a portion of the savings they created for their customers by implementing efficiency. Within a few years, no utility in California projected the need to build any more power plants, and all projected that they would meet all future demand growth through renewable generation. Under this plan Pacific Gas and Electric, the country’s biggest private utility, spent \$150 million in 1991 to help make its customers more efficient, and kept 15% of the resulting savings, boosting its 1990 profits by \$40-50 million. Doing this returned over \$40 million to PG&E’s bottom line and saved its customers nine times that much. The PUC found that between 1990 – 93 such efficiency measures saved customers a net present value of almost \$2 billion.²²³ Unfortunately free market advocates overturned this program.

In the early 1990’s there were an array of experiments underway to enable the market for delivering customer value to function better. Eight states request for proposals to vendors to compete in an open auction for all ways to make or save electricity at, say 1¢ per kilowatt hour. On receipt of bids they signed contracts. If they needed more capacity, they then reopened bidding for efficiency or supply at 2¢ per kWh, then 3¢. At around 2 – 3¢ they met all of their required capacity, dramatically cheaper than building a new fossil fired plant.

Some utilities traded saved electricity, rewarding customers for actively reducing electricity use, or for saving other customers’ electricity. There is talk of creating spot and futures, markets in saved electricity (in 1993, Britain created such a futures market). Some electric utilities sold unregulated electric efficiency in other utilities’ territories. Some jurisdictions implemented programs to charge fees to connect inefficient buildings to the grid, and paid rebates for connecting efficient buildings, both on an open-ended sliding scale.

Cities should discuss all of these are measures with their utility or Public Utility Commission.

It is important to recognize that despite the fixation of utilities and most policy experts on supplying kilowatt-hours at the lowest price, what customers

²²¹The Negawatt Revolution, www.eco-web.com/editorial/00892.html, 30 November 2006.

²²²Western Area Power Administration, www.wapa.gov/power/pmipr.htm, 30 November 2006.

²²³Hawken, Lovins Lovins, *Natural Capitalism*, P 273 – 74, Little Brown, 1999.

really want are the services that energy can deliver at least cost. And it is essentially always true that efficiency will do this cheapest, most reliably and with the fewest carbon emissions. Two programs, ENERGY STAR®, run by the Federal Department of Energy,²²⁴ and the State Scorecard on Utility Energy Efficiency Programs, run by the American Council for an Energy Efficient Economy²²⁵ offer assistance to utilities wishing to create energy efficiency programs.

Many states are now reviewing their utility policies. Simply entering “utility efficiency programs” in Google will return a wealth of information on what different states are doing. This is now a realm in which policy is

evolving very rapidly, and a city would be unwise to assume that the past must govern the future.

In New York, state regulators have imposed what is called a “system Benefit charge” (SBC) on all sales of electricity to pay for energy efficiency measures. Since 1998 most low-income energy efficiency programs have been funded through this SBC on electricity bills and administered by the New York State Energy Research and Development Authority (NYSERDA).

The SBC program, known as New York Energy \$mart SM, provides efficiency programs for all customer classes, including low-income renters and homeowners. The SBC program was created to ensure that certain

energy efficiency and energy research programs were adequately maintained during the state's transition toward a more competitive electric market.²²⁶

As part of its utility restructuring, electric utilities in the State of New Hampshire established energy efficiency programs for statewide implementation by utilities regulated by the Public Utilities Commission. These programs serve residential, commercial and industrial customers. They include programs for new construction, retrofitting existing structures, and rebate programs for selected lighting and appliances. In addition to the statewide programs, individual utility-specific programs exist, including a pilot Pay-As-You-Save (PAYS) program.²²⁷

Energy Efficiency Program

Case Study: SCORE Pilot Program, TX

TXU Electric Delivery operates the largest distribution and transmission system in Texas, providing power to three million homes and businesses and operates more than 114,000 miles of transmission and distribution lines in Texas. In 2006, TXU Electric Delivery's sponsored the Texas Schools Conserving Energy (SCORE) program, enabling seven participating school districts representing 95,416 students at 124 campuses to save enough energy to power 376 homes. In

2006, the programs saved 1,787 kilowatts and 4,257, 483 kilowatt hours of energy through energy efficiency measures. 95,416 students at 124 campuses In 2007 SCORE will enlist an additional eight to ten school districts.

SCORE is a public-private partnership and a component of TXU Electric Delivery's Energy Efficiency Program, providing viable energy efficiency and demand reduction solutions for public schools. Since its

inception in 2006 this program has saved over 350 megawatts of peak demand or enough energy to power 73,500 homes. Participating school districts identify the least energy-efficient facilities and develop an energy master plan so that they can reduce the district's energy bills. Reduced energy demand lowers budget pressures, provides infrastructure improvements, and better learning environments.²²⁸

²²⁴ Energy Star EEPs Resources, www.energystar.gov/index.cfm?c=reprs.pt_reps, 30 November 2006.

²²⁵ ACEEE, Steven Nadel, Toru Kubo, and Howard Geller, April, 2000, www.aceee.org/pubs/u004.htm, 30 November 2006.

²²⁶ U.S. Department of Health and Human Services, www.sustainable.doe.gov/dereg/states/nyork.htm, 30 November 2006.

²²⁷ New Hampshire CORE Energy Efficiency Programs, www.puc.state.nh.us/Electric/coreenergyefficiencyprograms.htm, 20 January. 2007.

²²⁸ TXU Electric Delivery Press Release, www.oncorgroup.com/about/newsroom/detail.asp?prid=1013, 29 January 2007.

Encourage Utility Providers to Set a Minimum Commodity From Renewable Energy Purchases

When a utility has achieved all of the cost effective efficiency it can, the next best bet is often the various renewable forms of supply. Renewable energy sources include wind, solar power, geothermal, hydropower, and various forms of biomass. Increasingly, electricity customers are being given supply options, either as retail power markets open to competition or when their regulated utilities develop green energy or efficiency pricing programs. More than 50% of retail customers in the U.S. now have an option of purchasing a green power product directly from their electricity supplier.^{229,230}

Utilities have created programs to help finance solar installations on customers' homes and factories. For Earth day 2005, Alameda County in California commissioned a 2.3 megawatt power plant, spread out on roofs all over the county, using county's energy bill \$700,000 a

solar cells. It will cut the local utility paid for half the year, and of the cost.

Since 1975, the city of Santa Clara, CA has taken a leading role in the development and promotion of the use of solar energy. That year, the city established the nation's first municipal solar utility. Under this program the city will supply, install and maintain solar water heating systems for residents and businesses within Santa Clara.²³¹

Utilities across the country are offering wind electricity to their customers. Fort Collins was the first utility in Colorado and among the first in the nation to deliver wind energy to customers. Its Wind Power Program started in 1998. Strong customer demand expanded the program in 1999 and 2000.

In June 2004, the program expanded again in order to meet the goals of the City Council's Electric Energy Supply Policy. At that time, the price for wind energy dropped from 2.5¢ per kWh to 1¢ per kWh.²³²

Other utilities offering wind power include Austin, Texas, Xcel Energy, Basin Electric in Montana, Oklahoma Gas and

Electric, Florida Power and Light and many others.²³³

Cities can purchase renewable energy directly. Many municipalities are realizing the benefits of diversifying their energy portfolio not only by implementing energy efficiency, but also by investing in renewable technologies (often called green power). Doing this can strengthen the local economy, have a positive impact on the local job market.²³⁴ Using local renewable power also increases the security of the community.²³⁵ Fossil fuel generated power generally comes from across state and even international borders, far from customer demand; whereas renewable energy sources are mostly smaller in size and locally owned and operated.²³⁶

Cities that purchase a green power product demonstrate increased demand for renewable technology. Such demand helps to develop further renewable energy sources, which can reduce the burning of fossil fuels.

Municipal or commercial utilities can set up green power programs for communities. In these programs residents have the opportunity to purchase renewable energy for their homes, businesses, etc.

²²⁹ U.S. DOE Green Power Network, www.eere.energy.gov/greenpower/buying/index.shtml, 19 September 2006.

²³⁰ Check to see if your State offers Green Power Programs.

www.eere.energy.gov/greenpower/buying/buying_power.shtml, 19 September 2006.

²³¹ City of Santa Clara, www.ci.santa-clara.ca.us/pub_utility/ws_muni_solar.html, 30 November 2006. For information, call the Solar Engineer at 615-2000.

²³² Fort Collins, Wind Power Program, fcgov.com/utilities/wind-history.php, 30 November 2006.

²³³ U.S. DOE, www.eere.energy.gov/greenpower/resources/tables/topten.shtml, 30 November 2006.

²³⁴ Robert Sanders, "Investment in Renewable Energy Better for Jobs As Well As the Environment," www.berkeley.edu/news/media/releases/2004/04/13_kamm.shtml, 30 November 2006.

²³⁵ The National Renewable Energy Laboratory's web site provides an additional discussion of the benefits of renewable energy. www.nrel.gov/learning/, 19 September 2006.

²³⁶ Interstate Renewable Energy Council, www.irecusa.org/municipal/municipal_guide.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Utilities/IREC_municipal_guide.pdf, 27 September 2006.

Such programs often charge a premium rate, although increasingly renewables such as wind power are cheaper than running existing coal plants.²³⁷

In a green power transaction, a utility (or power marketer) buys renewable energy from a renewable energy facility. This

electricity is delivered into the power pool, where it mixes with all the other electricity being generated at the time. Finally, the power is delivered to all customers of that utility. The mix of "green" and "brown" power is actually shared by everyone while the environmental attributes are credited to the customers who

have paid a premium to create that benefit.²³⁸

Many cities, states, federal agencies, universities and businesses have worked with their municipalities to offer green power purchasing programs.^{239,240} For more information about Renewable Energy Planning, refer to Chapter 5, Long Term Initiatives.

Renewable Energy Purchasing

CASE STUDY: Newark, DE

On January 24, 2005 the [Newark, Delaware City Council](#) unanimously approved a resolution to increase the city's purchase of renewable energy to 2% of total electricity use by 2006 or approximately 7.5 million kWh annually. The vote followed a recommendation made by the City's Conservation Advisory

Commission to increase renewable energy purchases from the current level of 0.1% to 0.5% in 2005 and 2% in 2006. It is estimated that the purchase will increase the average household electric bill by 14¢ per month in 2006. The city, which operates its own electric utility and purchases power on the

wholesale power market, currently uses about 373 million kWh of electricity annually.²⁴¹

CONTACT

Director of Finance
George Sarris
(302) 366-7080
gsarris@newark.de.us

Renewable Energy Purchasing

CASE STUDY: Boulder, CO

In November 2005 Boulder, Colorado announced that it exceeded its goals for a recent campaign designed to increase the number of residents and businesses purchasing green power. During the roughly two-month "Wind Power Challenge," 1,150 customers signed up to purchase wind power from local

renewable energy suppliers, far exceeding the campaign's goal of 500 new subscribers. When combined with the more than 5,700 pre-existing green power customers, about 16% of the city's residents and businesses now purchase green power. Collectively, these purchases

represent nearly 5% of the community's total electricity needs.

Due in part to the success of the challenge, which was sponsored by the city and local non-profit [Western Resource Advocates](#),²⁴² the U.S. Environmental Protection Agency's

²³⁷ In 2006, Xcel Energy was forced to rebate to its "Windsources" customers, because wind was the cheapest resource on the system. Recent documents released by the Colorado PUC show that the utility's projections that coal power would be the cheapest resource are wrong, and that limitations to rail capacity haul coal, rising coal prices and falling renewables costs are reversing the calculation.

²³⁸ Bonneville Environmental Foundation www.greentagsusa.org/GreenTags/faq.cfm, 19 September 2006.

²³⁹ Green Power Network www.eere.energy.gov/greenpower/buying/customers.shtml, 19 September 2006.

²⁴⁰ A number of programs or initiatives have been developed in the U.S. to help address green power product credibility, such as certification programs and advertising and marketing guidelines. These programs help to verify green power marketer claims as well as to educate and inform customers about environmentally preferable competitive market choices.

www.eere.energy.gov/greenpower/buying/consumer_protection.shtml, 19 September 2006.

²⁴¹ Green Power Network, Large Green Purchasers Database;

www.eere.energy.gov/greenpower/buying/customers.shtml?page=1&companyid=379, 19 September 2006.

²⁴² Western Resource Advocates, www.westernresourceadvocates.org/, 19 September 2006.

[Green Power Partnership](#)²⁴³ has designated the city a "Green Power Community," making Boulder the first community in Colorado to receive this distinction. The following local renewable energy suppliers participated in the city's wind power challenge: [Clean and Green](#),²⁴⁴ [Community Energy, Inc.](#),²⁴⁵ [Renewable Choice Energy](#),²⁴⁶ and Xcel Energy through its [Windsources](#)²⁴⁷ program.²⁴⁸

News Releases:

[Boulder exceeds goals of Wind Challenge: Becomes Green Power Community](#)²⁴⁹

[City of Boulder challenges community to increase wind power purchases](#)²⁵⁰

CONTACT

Susan Innis
Western Resource Advocates
(303) 444-1188, ext 221
susan@westernresources.org

Yael Gichon
City of Boulder
(303) 441-1914
Gichony@bouldercolorado.gov

Renewable Energy Purchasing

CASE STUDY: Radnor Township, PA²⁵¹

On February 10, the [Board of Commissioners of Radnor Township](#),²⁵² a suburb of Philadelphia with about 30,000 residents, unanimously approved a resolution to purchase wind energy to meet 62% of the township's electricity needs. Under a three-year contract with [Community Energy, Inc.](#),²⁵³ and the [Energy Cooperative of Pennsylvania](#) (ECAP),²⁵⁴ Radnor will purchase 1.4 million kilowatt-hours of wind energy annually to be supplied by the new 66-MW

Mountaineer Wind Energy Center in West Virginia. The Mountaineer Wind Energy Center in West Virginia is the largest wind power project east of the Mississippi River.

The township is offsetting the added cost of the green power with energy savings from the installation of energy-efficient LED traffic lights and competitive market savings from switching its entire electric load to ECAP.

News Release:

[Radnor Township Becomes National Leader With Wind Energy Purchase](#)²⁵⁵

CONTACT

John Halley
Community Energy
(215) 778-1133

Alexis Andrianopoulos
Radnor Township
(610) 688-5600 ext 179

²⁴³ EPA Green Power, www.epa.gov/greenpower/, 19 September 2006.

²⁴⁴ Clean and Green, www.cleanandgreen.us/map.php, 19 September 2006.

²⁴⁵ New Wind Energy, www.newwindenergy.com/, 19 September 2006.

²⁴⁶ Renewable Choice, www.renewablechoice.com/, 19 September 2006.

²⁴⁷ Xcel Energy Windsources Program, www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-2_735_16310-221-2_68_133-0,00.html, 19 September 2006.

²⁴⁸ Green Power Network, Large Green Purchasers Database; www.eere.energy.gov/greenpower/buying/customers.shtml?page=1&companyid=469, 19 September 2006.

²⁴⁹ City Boulder Wind Challenge, www.ci.boulder.co.us/index.php?option=com_content&task=view&id=1778&Itemid=165, 29 September 2006.

²⁵⁰ City of Boulder Wind Challenge, www.bouldercolorado.gov/index.php?option=com_content&task=view&id=1273&Itemid=165, 29 September 2006.

²⁵¹ Green Power Network, Large Green Purchasers Database; www.eere.energy.gov/greenpower/buying/customers.shtml?page=1&companyid=215, 19 September 2006.

²⁵² Radnor Township website, www.radnor.com/, 19 September 2006.

²⁵³ New Wind Energy, www.newwindenergy.com/, 19 September 2006.

²⁵⁴ Philadelphia Energy Cooperative, www.theenergyco-op.com/index.html, 19 September 2006.

²⁵⁵ U.S. DOE Energy Power Network, www.eere.energy.gov/greenpower/buying/pr/0303_radnor_pr.html, 19 September 2006.

CASE STUDY: Los Angeles, CA

In 2003, Los Angeles Department of Water and Power LADWP decided to purchase 40 megawatts per year of renewable energy from a biomass conversion facility to be built 150 miles outside of Los Angeles in Bakersfield. Scheduled to be operational around 2008-2009, the biomass facility will provide power to up to 40,000 L.A. homes while consuming around 2,700 tons of organic waste each day in its anaerobic production facility. The organic waste will be comprised of landscaping waste materials such as grass clippings and wood chips. The overall power provided to the city of Los Angeles will be around 1.3% of its total needs and cost around \$16 million every year.

The project will also create 54 permanent new jobs and around 200 construction jobs for the two and a half year building period.²⁵⁶ This is a great example of closing the materials loop. The waste materials reacting in the anaerobic digester will be supplied by the city. The facility will also provide its own power.

In 2004 the city passed a resolution approving a Renewable Portfolio Standard. The RPS mandates that 20% of the city's energy purchases come from renewable sources by 2017, with an interim of 13% by 2010.²⁵⁷

L.A.'s green power purchasing program operates via voluntary donations from customers that go

toward purchasing additional renewable energy or building new renewable energy generation. With current participation, 12,000 homes are powered with renewable energy, which is enough to spare 101 million pounds of CO₂ emissions annually through the program's use of clean energy.²⁵⁸

CONTACT

Green Power Team
LA Department of Water and Power
111 N. Hope Street, Los Angeles, CA 90012
(800) GREEN LA or
(800) 473-3652

²⁵⁶ Energy Vortex, www.energyvortex.com/pages/headlinedetails.cfm?id=1114&archive=1, 19 September 2006.

²⁵⁷ LAWDP Green Power 2005 Annual Report, www.ladwp.com/ladwp/cms/ladwp005196.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Utilities/LADWP_2005Report.pdf, 19 September 2006.

²⁵⁸ Ibid.

CASE STUDY: Lenox, IA

The city of Lenox, Iowa (population approximately 1,401)²⁵⁹ is considered one of the greenest cities in the U.S., deriving around 70% of its energy needs from renewable resources.²⁶⁰

In 2003, the city received a government grant to build a wind turbine that would supply up to 10% of the city's energy needs, on top of the already 60% that is derived from hydroelectric power. Through the city's Green Energy Program, 10% of Lenox's citizens pay an extra two dollars per month to support the renewable energy program, making it the most successful city program of its kind in the U.S. according to Patti Cale-Finnegan of the Iowa

Association of Municipal Utilities.²⁶¹ Each two-dollar donation produces about 100 kWh and equals a savings of about 150 lbs of carbon dioxide and 14.6 lbs of sulfur dioxide.²⁶²

Lenox had been planning the wind turbine for a few years before it found funding for the project. The kick came when the Iowa Department of Economic Development began looking for a city that might qualify for a \$400,000 grant for community development. In order to qualify, the city of Lenox had to have at least 51% of its population as low or moderate income, which it did.²⁶³ It also had a viable plan for a beneficial community project at hand, a perfect match.

The turbine produces as much as 15,000 kWh per day, garnering a lot of support for renewable energy within the community. Lenox is now looking into the possibility of a biodiesel production facility, and is studying the cost-effectiveness of another wind turbine.²⁶⁴

CONTACT

David Ferris
Lenox Municipal Utilities
(641) 333-2550

Patti Cale-Finnegan
Iowa Association of Municipal
Utilities
(515) 289-1999

²⁵⁹ City Data, www.city-data.com/city/Lenox-Iowa.html, 19 September 2006.

²⁶⁰ U.S. DOE Green Power Markets, www.eere.energy.gov/greenpower/markets/pr/1203_lenox_pr.html, 19 September 2006.

²⁶¹ Ibid.

²⁶² Ibid.

²⁶³ Energy Services Bulletin, www.wapa.gov/es/pubs/esb/2004/feb/feb043.htm, 19 September 2006.

²⁶⁴ Ibid.

Additional Resources

The Interstate Renewable Energy Council's website contains a wealth of useful information on municipal purchasing and implementation of renewable energy programs. www.irecusa.org/

EPA's Green Power Partner Resources is designed to help partners make the most of their green power purchase. Included are resources and information on how to:

- Partner tools
- Promoting your actions
- Communicating the environmental benefits of green power
- Communication support

These resources include purchasing guide, green power locator, communications guide, fact sheets, media tools, etc.

www.epa.gov/greenpower/partner_corner/index.htm

DSIRE is a comprehensive source of information on state, local, utility, and federal incentives that promote renewable energy and energy efficiency. www.dsireusa.org

Top Ten Green Power Programs as of 2005²⁶⁵

Green Power Program Renewable Energy Sales (as of December 2005)				
Rank	Utility	Resources Used	Sales (kWh/year)	Sales (Avg. MW ^a)
1	Austin Energy	Wind, landfill gas	435,140,739	49.7
2	Portland General Electric ^b	Existing geothermal and hydro, wind	339,577,170	38.8
3	PacifiCorp ^{cd}	Wind, biomass, solar	234,163,591	26.7
4	Florida Power & Light	Biomass, wind, solar	224,574,530	25.6
5	Sacramento Municipal Utility District ^e	Wind, landfill gas, small hydro, solar	195,081,504	22.3
6	Xcel Energy ^{ef}	Wind	147,674,000	16.9
7	National Grid ^{ghi}	Biomass, wind, small hydro, solar	127,872,457	14.6
8	Basin Electric Power Cooperative	Wind	113,957,000	13.0
9	Puget Sound Energy	Wind, solar, biogas	71,341,000	8.1
10	OG&E Electric Services	Wind	63,591,526	7.3

Source: NREL

Notes:

^a An "average megawatt" (aMW) is a measure of continuous capacity equivalent (i.e., operating at a 100% capacity factor).

^b Some products marketed in partnership with Green Mountain Energy Company.

^c Includes Pacific Power and Utah Power.

^d Some Oregon products marketed in partnership with 3 Phases Energy Services.

^e Product is *Green-e* certified (www.green-e.org). For Xcel Energy, only the Public Service Company of Colorado product is *Green-e* certified.

^f Includes Northern States Power, Public Service Company of Colorado, and Southwestern Public Service.

^g Includes Niagara Mohawk, Massachusetts Electric, Narragansett Electric, and Nantucket Electric

^h Marketed in partnership with Community Energy, EnviroGen, Green Mountain Energy Company, Mass Energy, People's Power & Light, and Sterling Planet

ⁱ Some products are certified by *Green-e* (www.green-e.org) or Environmental Resources Trust (www.ert.net).



NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDERADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548

²⁶⁵ NREL has compiled extensive data on utility green power programs and produced the following "Top Ten" lists of program characteristics and results: total sales of renewable energy to program participants; total number of customer participants; customer participation rates; and the premium charged to support new renewable development.
www.eere.energy.gov/greenpower/resources/tables/pdfs/0306_top10en_pr.pdf, also archived at,
www.climatemanual.org/Cities/Chapter5/BestBets/Utilities/GreenPricingProgram_NREL2005.pdf, 27 September 2006.

Chapter 5: Local Action Plan Best Bets Businesses

DOCUMENT CONTENTS

Promote Use of Energy, Water and Waste Audits by Businesses	96
CASE STUDIES:	
Portland, OR	98
Anaheim, CA	98
Provide Incentives to Encourage Energy Efficiency Standards	98
CASE STUDIES:	
Flower Mound, TX	99
Scottsdale, AZ	99
San Diego, CA	100
Energy Efficiency Standards in Commercial Building Codes	101
CASE STUDIES:	
Santa Monica, CA	101
State of California	102
Working with Power Plants and Other Significant Emitters	102
CASE STUDIES:	
State of Oregon	103
Seattle, WA	104
Help Small Businesses Prosper and Protect the Climate	104
CASE STUDY:	
Seattle, WA	105
Additional Resources	106

In any city, the business sector is a major user of energy, and thus an emitter of greenhouse gases (GHGs). There is a great deal that businesses can do to reduce their emissions profitably, but businesses, especially the small businesses that are the backbone of any community's economy need help to capture these opportunities. Most small businesses give little thought to how they use energy, have few resources to help them reduce their energy bills, and are reluctant to devote scarce management time, or scarcer funds to implementing significant changes in the way they do business.

Smart communities around the country are implementing programs to help their business community become more energy efficient.

One of the easiest programs to encourage a business to implement is a lighting retrofit. The U.S. Environmental Protection Agency (EPA) offers the ENERGY STAR® program to

help business people cut their use of energy.²⁶⁶ It works with local partners to help businesses implement lighting retrofits and other energy savings programs. The following example is described on the ENERGY STAR® website.²⁶⁷

Small business owner Joel Whitaker added \$800 per year to the bottom line of Whitaker Newsletters by installing more energy efficient light bulbs in the 24 fixtures in his 2,000 square foot office. The cost was partly financed by his local utility, an ENERGY STAR® Utility Ally, and partly by savings on his electric bill. The upgrades paid back in less than two years. After that even this very small office started saving almost \$800 per year.

Mr. Whitaker's utility, Public Service Electric & Gas (PSE&G), sent him a flyer about energy efficient. Soon after calling the utility's 800 number, he signed a Memorandum of Understanding with EPA. Mr. Whitaker had previously called a

²⁶⁶ EPA Small Business, www.energystar.gov/index.cfm?c=small_business.sb_index, 30 October 2006.

²⁶⁷ EPA Small Business Success Story, www.energystar.gov/index.cfm?c=sb_success.sb_successstories_whitaker, 30 October 2006.

local electrician to learn more about lighting efficiency, but found he knew more than the electrician. EPA's Financing Directory guided Whitaker to Atlantic Lighting and Supply Co., an ENERGY STAR® Distributor Ally. Atlantic surveyed his space for free and provided specifications, a cost analysis, and an environmental analysis. This process took Atlantic less than one hour. Atlantic included PSE&G rebates in their economic analysis and predicted the payback.

Whitaker then applied for financial assistance. Atlantic agreed to finance more than half of the upgrade cost. Whitaker simply repaid Atlantic with the savings from its electric bill, including signing over the rebate check it received from PSE&G.

Once Atlantic delivered the project materials, Mr. Whitaker contracted a different electrician he found listed on a church flyer to install them. The entire upgrade process, from survey to installation, took a little over a month. "Our lighting upgrade," Mr. Whitaker explains, "was a piece of cake: the financing was easily handled, and we got a local electrician to install everything. It was really no sweat."

Before the upgrade, Whitaker Newsletter's 24 fixtures were inefficient T-12 florescent lamps with magnetic ballasts. Such fixtures are common in small businesses. The electrician had

never before performed this type of lighting upgrade, but the straightforward directions make installation of 24 energy-efficient T-8 florescent lamps with electronic ballasts easy. Although the number of lamps per fixture was decreased, the employees thought the lighting was improved. And the improvement in lighting color gave the office a nice glow.

Whitaker also revamped one exit sign from incandescent to LED, an upgrade that increased the lamp life from 9 months to 50 years. This is especially important to Whitaker, since the local fire inspector had, in the past, warned the company about a burned-out exit lamp.

Mr. Whitaker was particularly impressed with the pollution prevention equivalency information supplied by EPA. His employees were impressed that he had done something good for the environment. Mr. Whitaker was so happy with the results of his lighting upgrade that he convinced a local municipality and a local school district to upgrade their facilities. He also helped PSE&G publicize energy efficiency programs by participating on the radio spots.

ENERGY STAR® helps businesses with energy efficiency information about lights and appliances, buildings and facilities, manufacturing, retail operations, and much more.

Promote Use of Energy, Water and Waste Audits by Businesses

The building sector is the major consumer of energy in the U.S, using over one third of all energy and two thirds of electricity.²⁶⁸

Yet it is cost effective to fix up almost any existing building to use dramatically less energy. New buildings can be 10 times more efficient than an ordinary building, existing ones three fold more efficient. Many businesses own their own building, but the majority rent space in someone else's building. Programs to reduce the carbon footprint of buildings need to address both owner-occupied spaces and rental space.

As described in the municipal building section of this chapter, many cities have made it mandatory to perform energy, waste and water audits on their municipal buildings. Because of these audits, cities have retrofitted numerous buildings, updating technology and capturing financial savings. Many communities support their businesses in conducting their own audits and making retrofits and updates to their buildings, but all should do this.

²⁶⁸ U.S. Green Building Council, www.USGBC.org, 30 October 2006.

CASE STUDY: Portland, OR

Portland's Energy Trust Building tune-up and operations program²⁶⁹ operates on the premise that buildings are like cars; they run most efficiently when they are properly cared for and periodically tuned up. The Energy Trust of Oregon, Inc.²⁷⁰, a public purpose organization helping Oregon citizens increase energy efficiency and renewable energy generation, enables

businesses to receive subsidized tune ups by qualified technicians to help save on energy costs and ultimately, carbon emissions.

The program is available to owners of large commercial buildings, and focuses on boiler and whole building tune-ups. On average, the program saves 10% of energy costs through tune-ups.

The Energy Trust expects to save about 300,000 therms and 6,700,000 kWh through this program annually, enough electricity and gas to heat about 1,000 homes in the Portland area for a year, and prevent the release of a significant amount of carbon. If a building qualifies, the city will provide the following assistance.

Phase	Incentive
Screening	Provided by Program, in collaboration with Service Provider when applicable
RCx Investigation	Custom incentive ranging from \$0.05 - \$0.10 per square foot, paid to Service Provider
Quick Fixes	Up to \$2,000, paid to Service Provider
Implementation	Up to \$0.03 per square foot, applies to measures with a simple payback of longer than one year, paid to Customer
Persistence	Up to \$4,500, paid to Customer

Portland also has significant programs to encourage the use of renewable resources by businesses. For instance, the biofuels program supports businesses that seek to create energy through the use of biofuels available in the state of Oregon. These fuels include, but are not limited to landfill gas, energy crops, and solid fuels based on residual material from forestry.

Energy Trust provides 100% of operating costs for the program to make it viable for a business. In addition, they will also provide assistance with initial feasibility studies.

Energy Trust also provides incentives of 35% of the system cost for businesses to install solar energy systems. During its first year, this program provided \$1.4 million in incentives for 126

different projects. Energy Trust also provides similar incentives for businesses to install solar water heaters.²⁷¹

CONTACT

Jan Schaeffer
(503) 445-7603
jan@energytrust.org

²⁶⁹ Energy Trust Building Tune-up and Operations, www.energytrust.org/bto/btu.html, 27 September 2006.

²⁷⁰ Energy Trust website, www.energytrust.org/index.html, 27 September 2006.

²⁷¹ Energy Trust, Wind Energy, www.energytrust.org/RR/wind/index.html, 27 September 2006.

CASE STUDY: Anaheim, CA

Anaheim, California has developed a program to retrofit required exit signs in buildings with efficient light-emitting diode (LED) or photo luminescent (glow in the dark) technology. Estimated savings per exit sign is

at least 90%. Because these signs must be on 24 hours a day, 7 days a week, and are required of all public buildings, the reduction can represent a significant energy decrease over a year.²⁷²

The city subsidizes the cost of retrofit at 50% of the total cost, or \$30 per fixture, whichever is less, at a total cost of up to \$10,000.

Savings Achieved by Converting to LED Lighting Technology			
	5 Exit Signs	50 Exit Signs	100 Exit Signs
Energy Savings On Incandescent Lamps (based on 50 total watts)	\$210/year	\$2,095/year	\$4,190/year
One-time Incentive Amount	\$150	\$1,500	\$3,000
Total Savings	\$360	\$3,595	\$7,190
Assumptions: 1. 8,740 annual operating hours for old and new exit lighting system. 2. Two watts to operate LED lighting. 3. \$0.10 composite kWh cost used for purposes of this illustration; your average energy cost may vary.			

CONTACT

Anaheim Public Utilities
(714) 765-4259

Provide Incentives to Encourage Energy Efficiency Standards

There are more than 76 million residential buildings and nearly five million commercial buildings in the U.S. today. By the year 2010, another 38 million buildings will be constructed. It is possible to make buildings that use little or no non-renewable energy, yet are far more comfortable and affordable.

Such buildings, called “green buildings” are healthier to live and work in, enhance the productivity of workers and enhance the security of the community.²⁷³ Cities can encourage developers to build using energy efficiency standards, even if no regulations are in place.²⁷⁴

Many incentives to encourage developers to use best practices require little investment for the city. For example, cities can offer:

Priority permit processing for builder/ developers who propose low-carbon projects

Reduced permit fees

Advertising and recognition for developers who use energy efficient, or renewable energy technologies.

The following cases provide examples of effective incentives being utilized by municipalities to encourage businesses to increase the efficiency of their operations.

²⁷² Anaheim Public Utilities Exit Sign Programs, www.anaheim.net/utilities/adv_svc_prog/led_exit_sign/index.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Businesses/Anaheim_ExitSignProgram.pdf, 27 September 2006.

²⁷³ U.S Green Building Council, www.usgbc.org, 3 October 2006.

²⁷⁴ County of San Diego Building Department, www.sdcounty.ca.gov/dplu/greenbuildings.html, 3 October 2006.

CASE STUDY: Flower Mound, TX

Flower Mound's Green Building Program offers free advertising and referrals if builders comply with the town's criteria for more energy efficient green buildings. By voluntarily complying with green building criteria set forth by the town, participating contractors can display a certification emblem in their advertising and get free publicity on the town's website.²⁷⁵

In order to qualify, participants must use a minimum of 30 best management practices from the town approved list for each project, as well as meet the following minimum practices.²⁷⁶

Building projects must be at least 25% more efficient than the guidelines set forth by current International Energy Conservation Codes.

Builders must be LEED certified and demonstrate continuous compliance of those certification requirements.

Before construction begins, builders must submit a waste reuse, recycling and reduction plan to be agreed upon by the city.

Landscaping and paving requirements not directly pertaining to carbon reductions also apply.

This program is an easy way to promote efficient building design with minimal use of public funds.

CONTACT

Director
Matthew Woods
Environmental Resources
(972) 874-6348
matthew.woods@flower-mound.com

CASE STUDY: Scottsdale, AZ

Scottsdale, Arizona has implemented a program to promote the building of more energy efficient and solar energy fueled buildings within the municipality through a series of economically enticing incentives.²⁷⁷ First, if a builder submits a qualified proposal for a green building, the permit process is expedited through the city's fast track plan review process. In other words, green building projects will receive

permits in roughly half the time of regular projects, thus promoting green design from the beginning.

Builders incorporating solar energy into their projects are eligible for a 25% tax credit for the cost of the solar energy system. In addition, the city will provide signs to go up at the job site to let the surrounding community know of the project's environmental benefits.

Participating architects, designers and builders are also offered free promotional space on the city website and in green building information packets that are distributed at various events and through the mail.

CONTACT

Anthony Floyd
Green Building Program
(480) 312-4202

²⁷⁵ Flower Mound Green Building website, www.flower-mound.com/env_res/env_res_green.php, 3 October 2006.

²⁷⁶ Flower Mound Green Building Program brochure, www.flower-mound.com/env_res/green_building_program.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Businesses/FlowerMound_grnbuilding.pdf, 3 October 2006.

²⁷⁷ City of Scottsdale Green Building Program, www.ci.scottsdale.az.us/greenbuilding/HowToJoin/Invitation.asp, 3 October 2006.

CASE STUDY: San Diego, CA

San Diego County²⁷⁸ instituted a Green Building Incentive Program²⁷⁹ to increase voluntary commitments to energy and resource efficient design. The program requires compliance with at least one of three resource conservation measures. The requirements assist builders and developers in reducing GHG emissions through increased recycled content or meeting energy efficiency measures.

To qualify for the incentives, the project must comply with one of the resource conservation measures listed:

1. Natural Resource Conservation
 - a. Recycled Content: A builder would be eligible for the incentive program by doing one of the following
 - Show that 20% or more of primary building materials being used contain, in aggregate, a minimum weighted average of 20% post-consumer recycled content materials (reused materials count as 100%).
 - Show that at least one primary building material (such as roofing) is 50% or more post-consumer recycled content.

- b. Straw Bale Construction: New buildings using baled straw from harvested grain for the construction of the exterior walls will qualify for the incentives
2. Water Conservation
The installation of a graywater system in new or renovated buildings will qualify for the incentives. Graywater is the wastewater produced from bathtubs, showers, and clothes washers. In order to conserve water, it can be used for irrigation through subsurface distribution systems. A permit²⁸⁰ is required from the Department of Environmental Health for the graywater system. Energy Conservation
Energy use below California Energy Commission (CEC) Standards qualifies for the incentives. Residential projects that exceed the minimum Title 24 standards by 15% and commercial projects that exceed the standards by 25% qualify for the Green Building Incentive Program. The applicant must demonstrate to the Building Division that the project exceeds the Title 24 minimum standards by submitting compliance documentation done on a computer program approved by the CEC.

The program offers incentives of reduced review process turnaround time, saving approximately 7-10 days, a 7.5% reduction in plan check and building permit fees for projects meeting program requirements and no fees for the building permit and plan check of residential photovoltaic systems

CONTACT

San Marcos Office
151 East Carmel Street
San Marcos, CA 92078-4309
(760) 471-0730

El Cajon Office
200 E. Main St., 6th Floor
El Cajon, CA 92020-3912
(619) 441-4030

²⁷⁸ County of San Diego Building Program, www.sdcountry.ca.gov/dplu/greenbuildings.html, 3 October 2006.

²⁷⁹ Brochure on San Diego Incentive Program, www.sdcountry.ca.gov/dplu/docs/DPLU%20273.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Businesses/SanDiego_BuildGreen.pdf, 3 October 2006.

²⁸⁰ CPC Title 24, Part 5, California Administrative Code, Appendix G.

Energy Efficiency Standards in Commercial Building Codes²⁸¹

Many cities have energy efficiency standards for their own buildings and have set a good example of how energy efficiency retrofits can pay back costs. Cities should extend these standards to commercial buildings.

The types of codes used to encourage energy efficiency standards can be categorized into two categories: Prescriptive and Performance Codes.

Performance codes set a mandatory target for the building to meet. These codes drive innovation for building developers, architects, contractors, etc. by allowing them to decide how to meet set targets. For example, builders must determine the best way to

meet Santa Monica's allowable energy budget for multi-family homes of 10%.

Prescriptive codes establish specific requirements for materials: for example, efficient boiler and furnace units with a minimum combustion efficiency of 80%.

The following case studies demonstrate how cities and states are setting energy efficiency standards using both prescriptive and performance codes.

Energy Efficient Commercial Building Codes

CASE STUDY: Santa Monica, CA

Santa Monica's green building requirements were designed to increase sustainability without putting excessive burdens on builders or developers. Many of the measures have some higher initial cost, though others can actually reduce first costs and operating costs. However, all of them increase the overall value of the building.²⁸²

The basis for the green building code is found in the following two performance based Ordinances and the Municipal Code²⁸³

1. [Green Building Ordinance](#)²⁸⁴
This city Ordinance establishes prescriptive energy-saving measures for small residential projects, and energy performance targets beyond Title 24 for all commercial and larger residential projects.
2. [Construction and Demolition Waste Recycling Ordinance](#).²⁸⁵ This Ordinance established requirements for reducing solid waste from construction related activities.

Santa Monica provides a design adviser to assist developers in understanding the process, what they must do to comply, what they should be doing to achieve a greater design and strategies to assist in the process.²⁸⁶

CONTACT

Green Building Program Advisor
1212 5th Street, First Floor
Santa Monica, CA 90401
(310) 458-8549

²⁸¹ Sustainable Green Building Guidelines, www.ciwm.ca.gov/GreenBuilding/Design/Guidelines.htm, 3 October 2006. Includes performance or prescriptive instructions for designers and builders to use in construction projects. These instructions address materials use, design principles and construction techniques.

²⁸² The U.S. Green Building Council has found that there is no evidence that there has to be a premium for building green. In studies in which an initial premium of up to 2% was found, the green measures saved 20% of the construction costs over the lifetime of the building, www.usgbc.com, 3 October 2006.

²⁸³ Santa Monica Green Building Program, greenbuildings.santa-monica.org/requirements/projectrequirements.html, 27 September 2006.

²⁸⁴ Santa Monica Green Building Ordinance, greenbuildings.santa-monica.org/whatsnew/green-building-ordinance/green-building-Ord-1-5-2002.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Businesses/SantaMonica_Ordinance.pdf, 3 October 2006.

²⁸⁵ Santa Monica Waste Recycling Ordinance, greenbuildings.santa-monica.org/whatsnew/waste.ordinance.html, 30 October 2006.

²⁸⁶ Santa Monica Design Adviser, greenbuildings.santa-monica.org/GBDA.htm, 27 September 2006.

CASE STUDY: State of California

California has developed a list of possible energy efficiency and sustainable building measures that builders should use to comply with state building codes.

²⁸⁷ These checklists (Tier 1 and Tier 2) are updated annually and attached to the Department of General Services' Standard Contract for Architectural and Engineering Services, Exhibit C.

The items on Tier 1 have been

evaluated as "cost effective" and all are recommended for inclusion in building designs. Tier 2 items may or may not be cost effective, but should be considered for inclusion in projects. Both checklists are submitted at the completion of the preliminary plan phase.

The checklists include a few performance standards, but are more prescriptive in nature.

These prescriptive codes provide direction for California builders about the minimum measures needed to meet energy efficiency codes.

CONTACT

Gregory Dick
Green Buildings
(916) 341-6489
gdick@ciwmb.ca.gov

Working with Power Plants and Other Significant Emitters

After reviewing the community's GHG baseline inventory, it is important to identify any businesses that emit higher levels of GHGs through their operations. If these businesses are present within the boundaries of a city, addressing these emissions is a critical means of managing emissions in the community.

In several states, power plants' emissions are already or will soon be regulated at the state level in the near future. Until recently, the state of Oregon and Massachusetts were the only states to have CO₂ standards for power plants.²⁸⁸ However, several Northeast and Mid-

Atlantic states have initiated a Regional Greenhouse Gas Initiative to regulate the carbon dioxide emissions of power plants in the region. Under Assembly Bill 32, California will begin regulating emissions from businesses and power plants in California and even power plants outside the state that wish to sell into California. These regulations will soon influence power plants, but not other high emitters in the region.

Communities hoping to reduce emissions without or beyond regulations can create their own incentives or encourage high GHG emitters to commit to a variety of voluntary reduction programs and networks. For example, the EPA Climate Leaders program helps, "companies to develop long-term comprehensive climate change

strategies," such as developing GHG inventories and reduction plans.²⁸⁹ Similarly, The Pew Center's Business Environmental Leadership Council (BELC)²⁹⁰ is an association of corporations working together to address the challenges of climate change.

In addition to the resources listed below, such programs as the EPA Climate Leaders and the BELC websites, illustrate state and utility initiatives to work with large commercial emitters.

Recently, major banks have begun to put pressure on their major clients who have significant carbon footprints. JP Morgan Chase recently issued a statement to their clients that any who were significant emitters should put in place a plan to reduce emissions. This followed similar programs by Bank of America Corp and CitiBank.²⁹¹

²⁸⁷ Green Building Tiers www.ciwmb.ca.gov/GreenBuilding/Design/Tiers.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Businesses/GrnBuildingTiers.pdf, 27 September 2006.

²⁸⁸ Oregon's Power plant Codes, www.newrules.org/electricity/climateor.html, 27 September 2006.

²⁸⁹ EPA Climate Leaders, www.epa.gov/stateply/, 5 October 2006.

²⁹⁰ Business Environmental Leadership Council, www.pewclimate.org/companies_leading_the_way_belc/company_profiles/, 5 October 2006.

²⁹¹ Bustillo, Miguel, "A Shift To Green" Los Angeles Times 12 June, 2005.

CASE STUDY: State of Oregon

In 1997, the Oregon Legislature gave the Energy Facility Siting Council authority to set carbon dioxide emissions standards for new energy facilities.²⁹² Under

[Division 24](#)²⁹³ of the Council's rules, beginning at OAR 345-024-0500, there are specific regulations, known as the Oregon Standard for CO₂, for base load

gas plants, non-base load (peaking) power plants and non-generating energy facilities that emit carbon dioxide. These standards are as follows:

Base load gas plants	0.675 lb. CO ₂ / kWh
Non-base load gas plants	0.675 lb. CO ₂ / kWh
Non-generating facilities	0.504 lb. CO ₂ / horsepower-hour

The standard for base load gas plants applies only to natural gas-fired plants. The standards for non-base load plants and non-generating facilities apply to all fuels. The Council has not yet set carbon dioxide emissions standards for base load power plants using other fossil fuels. Rules allow base load gas plants that have power augmentation equipment to meet both the base load and non-base load standards for the respective parts of the plant. The definitions for the facilities are in [Division 1](#).²⁹⁴

The calculations for compliance with the standard account for the

efficiency of the facility. Generating plants have the option of offsetting part or all of their excess carbon dioxide emissions through guaranteed cogeneration.

At their discretion, applicants can propose carbon dioxide offset projects they or a third party will manage, or they can provide funds via the "monetary path" to the [The Climate Trust](#).²⁹⁵ The Council recognizes The Climate Trust as a "qualified organization," as defined in [statute](#)²⁹⁶ (ORS 469.503). This

definition appears also in Council [rules](#)²⁹⁷ (OAR 345-001-0010(45)). The Climate Trust takes responsibility for obtaining offsets when an applicant uses the "monetary path." Once a site certificate holder has provided adequate funds to The Climate Trust, it has met its obligations under the carbon dioxide standard.

CONTACT

Tom Stoops
Energy Facility Siting Council
Tom.Stoops@state.org.us

²⁹² Oregon Energy Facility standard, www.oregon.gov/ENERGY/SITING/standards.shtml#Carbon_Dioxide_Emissions, 27 September 2006.

²⁹³ Oregon Energy Facility standard, egov.oregon.gov/ENERGY/SITING/docs/rules/div24.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Businesses/Oregon_Div24.pdf, 3 October 2006.

²⁹⁴ Oregon Energy Facility standard, egov.oregon.gov/ENERGY/SITING/docs/rules/div1.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Businesses/Oregon_Div1.pdf, 3 October 2006.

²⁹⁵ The Climate Trust, www.climatetrust.org/, 3 October 2006.

²⁹⁶ Oregon Legislative, Energy; Conservation Programs; Energy Facilities, landru.leg.state.or.us/ors/469.html, 3 October 2006.

²⁹⁷ Oregon Energy Facility standard, egov.oregon.gov/ENERGY/SITING/docs/rules/div1.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Businesses/Oregon_Div1.pdf, 3 October 2006.

CASE STUDY: Seattle, WA

While the Oregon Standard has helped the Northwest become more climate friendly at the regulatory level, Seattle, Washington's public utility, Seattle City Light demonstrates how a utility can engage in voluntary emissions reductions. The utility is on the leading edge of climate protection by managing its own emissions, as well as working with other businesses in the city to reduce emissions.

In 2005, Seattle City Light announced that it had reached its goal of becoming "carbon neutral", meaning having no "net emissions" of GHG. The utility has a natural advantage for reducing emissions; last year over 90% of its electricity came from hydroelectric dams. Another 4% of electricity originated from nuclear plants and the remaining electricity was generated from wind farms and natural gas- and coal-fired power plants.²⁹⁸ Despite the high percentage of renewables in its portfolio, it is still responsible for

releasing about 200,000 metric tons of carbon dioxide each year. To claim no "net emissions" of GHG Seattle City Lights pays to offset (see Chapter 5 Infrastructure section) its emissions by investing in activities that reduce GHG elsewhere.

For example, the city has spent up to \$756,000 purchasing offset credits generated by activities such as converting city vehicles and buses to a mix of diesel and biodiesel and concrete plants to a cleaner manufacturing process.²⁹⁹ While claiming these offsets, the city notes the importance of being proactive while also "transparent and accountable."³⁰⁰

Seattle City Light also operates the Climate Wise Program, which encourages local voluntary businesses and institutions to combat global warming. According to the website:
... partners assess their business opportunities, invest

in new, more efficient equipment and practices, and share these achievements with peers and the public. As leading companies know, environmental performance provides a competitive edge³⁰¹

Partners in the project agree to identify and implement practices that reduce GHG; complete, update, and strive to improve upon a Climate Wise Action Plan; and inform others about Climate Wise activities.³⁰² Members of the Climate Wise include several companies with typically higher emissions businesses, such as Ace Galvanizing, The Boeing Company and the cement producer LaFarge Corporation.

CONTACT

Program Manager
Jack Brautigam
Climate Wise Partners
(206) 684-3954
jack.brautigam@seattle.gov.

Help Small Businesses Prosper and Protect the Climate

Controlling emissions of large corporations is essential in mitigating GHGs, but the role of smaller businesses is also important and is often neglected. As the story of Joel Wittaker at

the beginning of this chapter shows, with proper incentives small businesses can save money on energy costs and significantly contribute reducing greenhouse gases in a community.

²⁹⁸ Stiffler, Lisa. "No global warming at City Light." Seattle Post- Intelligent Reporter. 10 November, 2005. seattlepi.nwsource.com, 5 October 2006.

²⁹⁹ Ibid.

³⁰⁰ Ibid.

³⁰¹ Seattle Climate Wise Partners, www.seattle.gov/light/conserves/business/climatewise/, 5 October 2006.

³⁰² Ibid.

CASE STUDY: Seattle, WA

The objective of the city run “Smart Business Program” is to encourage businesses to convert old lighting fixtures to newer, highly energy efficient technology through city rebates on retrofit costs. Interior lighting can sometimes account for up to 60% of a small business’ energy bills. Replacing inefficient lighting with newer technology can thus deliver large energy savings. In addition, better lighting can promote increased worker productivity and a safer working environment.

Seattle offers the program to small businesses that are not part of an institution, chain or campus. One eligible business, a glass company, replaced their T-12

fluorescent lights with technologically superior T-8 fluorescent lights. The retrofit dramatically increased light levels, increased productivity and decreased the electricity bill, resulting in a happy businessowner and decreased reliance on grid energy. This particular client’s overall bill for the retrofit was \$6,291. With a smart business rebate of \$4,380, the overall cost to the client came to \$1,911. Given the estimated annual savings from the retrofit of \$1,170, this client’s retrofit is expected to pay for itself in just over a year and a half.³⁰³

In 2005, the Smart Business Program served 364 small businesses and achieved a

yearly energy savings of 4,113,135 kWh, or 11,300 kWh per business. The ratepayers of Seattle’s publicly owned power utility, Seattle City Light, fund the program. Seattle City Light seeking to diversify into other renewable energy sources in the coming years. In 2000 they sold 8% of their holdings in the Centralia coal fired plant in a step toward decreasing carbon emissions.³⁰⁴

CONTACT

Charles Valentin
(206) 684-4215
charles.valentin@seattle.gov

³⁰³ Seattle City Light Smart Business Program, www.seattle.gov/light/conservation/business/cv5_sbiz.htm, 27 September 2006.

³⁰⁴ Puget Sound Business Journal, June 2000, www.bizjournals.com/seattle/stories/2000/06/05/story1.html, 27 September 2006.

Additional Resources

California Sustainability Financial Incentives

www.dsa.dgs.ca.gov/Sustainability/incentives.htm

California Department of Energy provides information on incentives in the areas of Energy, Water, Materials, Siting, Green Building, Landscaping and Transportation. This list will be updated quarterly and does not claim to contain all existing funding options. If you know of a financial assistance program that is not on this list or should no longer be on this list then please contact:

Panama.Bartholomy@dgs.ca.gov or Shweta.Bhatt@dgs.ca.gov

- Incentives relating to [Energy](#)³⁰⁵, including conservation, efficiency, renewables, self-generation and commissioning.
- Incentives related to [Water](#),³⁰⁶ including conservation, efficiency and re-use.
- Incentives related to [Material selection and Waste management](#),³⁰⁷ including recycled content, re-use and waste reduction.
- Incentives related to [Siting](#),³⁰⁸ including brownfield redevelopment and "Smart Growth" strategic planning.

- Incentives related to [Green Building](#),³⁰⁹ including grants for projects and programs, plan review expediency and Leadership in Energy and Environmental Design (LEED) submission cost coverage.
- Incentives related to [Landscaping](#),³¹⁰ including education, tree-planting, mitigation and restoration.
- Incentives relating to [Transportation](#),³¹¹ including: bicycle and pedestrian safety and facilities construction and alternatively fueled vehicles.
- Incentives relating to [Miscellaneous](#),³¹² including: financing programs granted by private institutions.

Center for Small Business and the Environment offers an array of information for small businesses interested in climate protection. Contact: Byron Kennard, Executive Director
The Center for Small Business and the Environment
P.O. Box 53127
Washington DC, 20009
202 – 332-6875
www.aboutcsbe.org

NATURAL CAPITALIMS SOLUTIONS IS A 501 (C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548

³⁰⁵ www.dsa.dgs.ca.gov/Sustainability/energy.htm, 3 October 2006.
³⁰⁶ www.dsa.dgs.ca.gov/Sustainability/water.htm, 3 October 2006.
³⁰⁷ www.dsa.dgs.ca.gov/Sustainability/wastemgmt.htm, 3 October 2006.
³⁰⁸ www.dsa.dgs.ca.gov/Sustainability/siting.htm, 3 October 2006.
³⁰⁹ www.dsa.dgs.ca.gov/Sustainability/greenbldg.htm, 3 October 2006.
³¹⁰ www.dsa.dgs.ca.gov/Sustainability/landscaping.htm, 3 October 2006.
³¹¹ www.dsa.dgs.ca.gov/Sustainability/transportation.htm, 3 October 2006.
³¹² www.dsa.dgs.ca.gov/Sustainability/Miscellaneous.htm, 3 October 2006.



Chapter 5: Local Action Plan Best Bets Climate Friendly Residences

DOCUMENT CONTENTS

Residential Home Efficiency Upgrades	107	Home Size Restrictions, Taxing Large Residential Energy Consumers	119
CASE STUDIES:		CASE STUDIES:	
Anita, IA	108	Aspen, CO (Pitkin County) .	120
Osage, IA	108	Marin County, CA	120
Wakefield, MA	109	Energy and Water Efficiency by Smart-Metering, Price Signals and Price Structuring.....	121
Palo Alto, CA	109	Innovative Electrical Metering .	121
Seattle, WA.....	109	Additional Resources	122
Local Policies to Promote Renewable Energy	110		
CASE STUDIES:			
Sacramento, CA	110		
Mahonoy Township, PA.....	111		
Boulder, CO.....	111		
Palo Alto, CA	111		
El Centro, CA.....	112		
Aspen, CO	112		
State of Minnesota.....	112		
Lower-income Weatherization Assistance	113		
CASE STUDIES:			
Moose Jaw, Canada	114		
Seattle, WA.....	114		
Dearborn, MI.....	115		
Portland, OR.....	115		
Split Incentives in Renter Occupied Homes.....	116		
CASE STUDIES:			
State of Maine	116		
State of Vermont.....	117		
Allegheny, PA	118		
Lake Champlain, VT	118		
State of New York.....	119		
San Diego, CA.....	119		

Residential Home Efficiency Upgrades

Residents can help cities achieve carbon-footprint reduction goals by increasing the energy efficiency of their homes. New and replacement electrical appliances are prime targets for efficiency upgrades. A number of community-owned public utilities and some investor owned utilities offer appliance rebates to help residents choose energy efficiency. The easy targets for rebates are lighting, refrigerators and water heaters. Other electrical and water-conservation targets include clothes washers and dishwashers. In some cases, special utilities create special opportunities for rebates and incentives.

CASE STUDY: Anita, IA

Anita Municipal Utilities (AMU) is the non-profit redistribution utility in Anita, IA (pop. about 1,200). Wholesale power is purchased from a combination of sources and provided to the town. Power is purchased at an "interruptible" rate meaning that AMU must stop taking power if loads go high enough to cause problems to their supplier. There is a built-in practical incentive for energy efficiency. The city offers rebates to install or retrofit efficient space-heating equipment (when replacing gas or propane) at \$10/kW saved (up

to \$250). There is a \$50 rebate for efficient electric water heaters. They also offer rebates up to \$450 on air-to-air, ground-loop and water source systems. Grants are available for geothermal heat pump systems of \$500.³¹³

AMU encourages customers to voluntarily contribute to a "Green Energy" program that enables the utility to burn B2 soy diesel (a mix of 2% soy diesel made in Iowa with 98% diesel). Customer contributions offset the \$0.02/gal difference in cost compared to

normal diesel. Each \$1.50 contributed to the program would convert about 1,000 kWh to "Green Energy" which is blended in to the electrical energy provided by AMU. Customers are encouraged to commit to \$1.50, \$3, or \$5 per month added to their bills for a 12-month minimum.

CONTACT

Anita Municipal Utilities
(712) 762-3845
amu@anitaiaowa.com

CASE STUDY: Osage, IA

Osage Municipal Utilities (Osage, IA pop. 3,600) operates an efficiency incentive program that has saved residents about \$1.2 million per year in their utility bills (for a total cost to the utility of about \$250,000). The program uses a range of giveaway programs, rebates and energy audits to promote energy efficiency among its customers.

Services offered include, among other things, free compact fluorescent bulb giveaways and rebates, energy audits, electrical system scans to identify line-loss, free use of electrical tester

meters to locate inefficient appliances, complete energy audits and interest buy-downs for efficiency projects. When it began in 1974, the voluntary program was saving residents over \$1 million each year. The program cut energy prices to half that of the state average, and unemployment to half that of the national average, as the lower bills enticed more factories to come to town. The extensive efficiency measures taken in this small town have reduced its natural gas consumption by 45% and its annual growth in electricity demand by half, from

6% to 3%. The 950 compact fluorescent bulbs in use will prevent the burning of nearly 200 tons of coal, and every year the compact fluorescent bulbs will reduce annual pollution by nearly 1,000 tons of carbon dioxide (CO₂) and 13 tons of sulfur dioxide (SO₂).³¹⁴

CONTACT

Dennis M. Fannin
Osage Municipal Utilities
P.O. Box 207
720 Chestnut Street
Osage, IA 50461
(515) 732-3731

³¹³ Anita Municipal Utilities, www.anitaiaowa.com/utility.html#program, 3 October 2006.

³¹⁴ "Osage Municipal Utilities Demand-Side Management" Smart Communities Network website. www.smartcommunities.ncat.org/success/osage_muni.shtml, 5 October 2006.

Home Efficiency Upgrades

CASE STUDY: Wakefield, MA

The Wakefield Municipal Gas and Light Department (Wakefield, Massachusetts, pop. 25,000), in cooperation with the Massachusetts Municipal Wholesale Electric Company³¹⁵ offers rebates on ENERGY

STAR® labeled appliances. Rebates are available on programmable thermostats (\$20), clothes washers (\$50), dishwashers (\$50) and water heaters (\$100).³¹⁶

CONTACT

(888) 333-7525 or
(888) 335-7203
energyquestions@mmwec.org

Home Efficiency Upgrades

CASE STUDY: Palo Alto, CA

The mid-sized city of Palo Alto, California (pop. about 60,000) offers an extensive rebate program on many appliances including dishwashers, refrigerators, gas furnaces, central air conditioning, boilers, attic/roof and wall insulation, pool pumps and water heaters.

Rebate examples range from \$50 for a dishwasher, \$200 for pool pumps and up to \$300 for thorough insulation, \$250 for tank-less or very efficient standard tank water heaters. They have also partnered with the Santa Clara Valley Water District (SCVWD) to offer up to

\$150 rebates on clothes washers and currently developing an appliance recycling rebate.^{317,318}

CONTACT

Utility Marketing Services
(650) 329-2241
cpauresidential@cityofpaloalto.org

Home Efficiency Upgrades

CASE STUDY: Seattle, WA

Seattle City Light, Seattle, Washington's municipal electric utility offers numerous rebates to encourage efficiency. For example, residents can get a \$20 instant rebate on more efficient light fixtures (purchased from

certain stores) and up to \$100 on a clothes washer.³¹⁹

The utility also offers a free Home Resource Profile, which is a detailed, customized report that shows you how your household

uses energy, water and solid waste.

CONTACT

Residential & Small Business
(206) 684-3800
rescons.scl@seattle.gov

³¹⁵ Home Energy Loss Prevention Service, www.munihelps.org, 5 October 2006.

³¹⁶ ENERGY STAR® catalog for participating customers, www.energyfederation.org/estarlights/default.php, 3 October 2006.

³¹⁷ Palo Alto Appliance Rebates, www.cpau.com/programs/appliance/aplusindex.html, 3 October 2006.

³¹⁸ Palo Alto Smart Energy Program, 2006-2008. www.cpau.com/programs/smtenergy/smartenergyform.pdf, also archived at www.climatemanual.org/Cities/Chapter5/BestBets/Residential/PaloAlto_smartenergy.pdf, 3 October 2006.

³¹⁹ Seattle Residential Conservation Programs and Services, www.ci.seattle.wa.us/light/conserve/resident/, 3 October 2006.

Local Policies to Promote Renewable Energy

There are a range of challenges for residents seeking to use renewable energy in their homes, including siting restrictions, lack of understanding of the technology, and long payback periods. Municipalities can shape regulation and provide incentives to assist residents in overcoming these hurdles.

Policies to Promote Renewable Energy

CASE STUDY: Sacramento, CA

The Sacramento Municipal Utility District (SMUD)³²⁰ offers rebates and loan financing for solar hot water system installation (city pop. about 400,000). Rebates of \$1,500 per solar water heating system are available for SMUD residential customers who replace their electric water heating system. In addition, SMUD offers 100% loan financing to cover the remaining costs, with a ten-year repayment period. SMUD provides all the funding for these incentives, and

free maintenance inspections after five years and again after 10 years.

SMUD also currently offers an incentive of \$2.80 per watt-AC up to \$14,000 to residential customers who contract directly with SMUD approved contractors for the purchase and installation of grid-connected solar electric (PV) systems. The incentive will be paid to the approved PV contractor and is intended be reflected in the contractor's bid to

the customer. Both traditional PV modules and building-integrated PV "roof shingles" are available under the program.³²¹

CONTACT

Mike Zannakis
Sacramento Municipal Utility District
(916) 732-6994

(888) 742-7683
mzannak@smud.org

³²⁰ Sacramento Municipal Utility District, www.smud.org, 3 October 2006.

³²¹ DSIRE, California Incentives for Renewables and Efficiency, www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA13F&state=CA&CurrentPageID=1&RE=1&EE=1, 3 October 2006.

Policies to Promote Renewable Energy

CASE STUDY: Mahonoy Township, PA

Working with Community Environmental Legal Defense Fund (CELDF) the community of Mahoney Township, Pennsylvania, has been the first city in the state to introduce an ordinance to prohibit unsustainable energy production within the township, mandate a transition to sustainable energy

systems within the township, provide for the "enforcement of the ordinance and the rights of residents and nature" and provide for financial assistance for the conversion to sustainable energy systems.³²² The township plans to finance the plan with a general revenue bond. As of October 2006, the Bill is awaiting passage.

CONTACT

Community Environmental Legal Defense Fund
675 Mower Road
Chambersburg, PA 17201
(717) 709-0457
info@celdf.org

Policies to Promote Renewable Energy

CASE STUDY: Boulder, CO

The city of Boulder, CO (pop. about 90,000) enacted an ordinance in 1991 to protect the use of solar energy.³²³ The ordinance guarantees access to sunlight for homeowners and

renters in the city. This is done by setting limits on the amount of permitted shading by new construction and requiring that new buildings be sited to provide good solar access.³²⁴

CONTACT

City of Boulder
Building Services Center
1739 Broadway
(303) 441-1880

Policies to Promote Renewable Energy

CASE STUDY: Palo Alto, CA

The city of Palo Alto Utilities offers cash rebates to residents and businesses on the installation of new photovoltaic (PV) systems. Residents are eligible for a rebate of \$3 per watt-AC up to a \$9,000 maximum for a 3 kilowatt system. Commercial customers are eligible for a rebate of \$2 per Watt-AC up to \$50,000 maximum for a 25 kilowatt system. Nonprofit and institutional customers who are not eligible

for federal tax credits are eligible for a \$3 per watt rebate up to a \$30,000 maximum for a 10 kilowatt system.³²⁵

The Southern California Gas Company offers a similar rebate program for solar, but also extends rebates to other renewable and non-renewable alternative energies. The PV rebate is \$2.80/ W (30kW minimum). They also offer rebates on wind turbines

(\$1.50/W), renewable and non-renewable fuel cells (\$2.50-\$4.50/W), and waste gas generators and turbines (\$0.60-\$0.80/W).

CONTACT

City of Palo Alto
Utilities Customer Service Center
(650) 329-2161
UtilitiesCustomerService@cityofpaloalto.org

³²² Mahoney Ordinance: www.celdf.org/Ordinances/SustainableEnergyOrdinance/tabid/256/Default.aspx, 29 September 2006.

³²³ Solar Access Compliance, www.boulder.colorado.gov/files/PDS/codes/solrshad.pdf, also archived: www.climatemanual.org/Cities/Chapter5/BestBets/Residential/Boulder_SolarAccess.pdf, 5 October 2006.

³²⁴ Boulder Planning and Development Services, www.ci.boulder.co.us/buildingservices, 3 October 2006.

³²⁵ Palo Alto PV Partners Program, www.cpau.com/programs/pv-partners/pvindex.html, 3 October 2006.

Policies to Promote Renewable Energy

CASE STUDY: EI Centro, CA

Through the PV Solutions Rebate Program, Imperial Irrigation District³²⁶ (EI Centro, CA) provides rebates to residential and commercial customers who install grid-tied

PV systems. The rebate is \$2.80 per Watt-AC, up to a maximum of \$28,000 for residential systems and a maximum of \$84,000 for commercial systems.³²⁷

CONTACT

IID Public Programs Office—
Imperial Valley Imperial Irrigation
District
(760) 339-9032
info@iid.com

Policies to Promote Renewable Energy

CASE STUDY: Aspen, CO

The Community Office for Resource Efficiency (CORE) in Aspen and the Roaring Fork Valley area of Colorado offers a similar set of incentives—grid-tied PV power buyback, and zero-interest loan financing.³²⁸

Residents who purchase a solar PV system receive a cash rebate from CORE based on the number of watts they install.

CORE will give \$2.00 per watt installed by a certified installer and tied into the electric grid. This rebate is up to \$6,000. Residents may also finance that PV system with a Zero-Interest Loan. (The Loan OR the Rebate program are available but not both for the same project).³²⁹ Purchases of a solar hot water system are eligible for cash

rebates also—\$1,000, \$1,500, and \$2,000 for a 2-3 panel, 4-5 panel, or 6 or more panel system, respectively.

CONTACT

Gary Goodson
(970) 544-9808
gary@aspencore.org

Policies to Promote Renewable Energy

CASE STUDY: State of Minnesota

Along with a 30% federal tax credit and a state sales tax exemption for solar energy systems, Minnesota excludes from (real estate) property taxation the value added by solar-electric PV systems. However, the land on which a PV or wind system is located is taxable. In addition, all real and

personal property of wind-energy systems is exempt from the state's property tax³³⁰. The state also has a retail tax exemption when purchasing PV systems. An analysis has not been conducted to determine the money saved or number of PV systems installed.

CONTACT

Lise Trudeau
Energy Information Center
Minnesota Department of
Commerce, Energy Division
(651) 296-5175
lise.trudeau@state.mn.us
energy.info@state.mn.us

³²⁶ IID Energy – Energy Saving-Tips, www.iid.com/, 3 October 2006.

³²⁷ IID Energy - PV Solutions Rebate Program, www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA50F&state=CA&CurrentPageID=1&RE=1&EE=1, 3 October 2006.

³²⁸ Aspen Community Office for Resource Efficiency, www.aspencore.org/sitepages/pid46.php, 3 October 2006.

³²⁹ The Community Banks of Colorado is the partner for this program. Call their Aspen branch at (970) 544-8282 for more information.

³³⁰ Minnesota Department of Commerce, www.commerce.state.mn.us, 3 October 2006.

Lower-income Weatherization Assistance

Programs to help homeowners weatherize their homes can help a city reduce its carbon footprint. This is particularly true of low to middle income homeowners, who are otherwise unlikely to participate. Numerous public utilities, and non-profit organizations, offer services that come into the home to help residents assess energy inefficiencies and remedy them. Also, in many cases there is state and federal funding administered by municipalities to cover the costs of adding insulation and increasing efficiency when repairing or remodeling a home.³³¹

A 2002 report on weatherization programs, *Meeting the Challenge: The Prospect of Achieving 30% Energy Savings Through The Weatherization Assistance Program*, by the DOE, surveyed four cities, one from the Northeast (Schenectady, NY), Midwest (Moline, IL), South (Birmingham, AL), and West (Eureka, CA).³³² The report states that “high-energy use” homes in colder climates can achieve savings over 30%, and in warmer climates savings of about 25%. Annual savings of approximately \$370 to \$410 are

estimated for high-energy-use houses in the warmer climate regions.³³³ The report’s extensive data and assessments are a valuable resource for communities seeking to design successful programs. The level of energy savings achieved obviously depends on the extent of the weatherization undertaken, both in terms of cost, and which measures will be effective in each climate. Thus regional considerations are important when deciding on which steps to take.

For example, the report shows that a \$2,400 weatherization package can enable a “typical” home in the Midwest to achieve energy savings of about 20% and CO₂ reductions of about 20%. A “high-energy use” house can achieve greater savings (about 22%) and CO₂ reductions (22%). An “expanded” package achieves even greater gains. Weatherization measures resulting in relatively high savings for most of the houses studied are air sealing, installing attic and wall insulation, replacing an old refrigerator with a high-efficiency unit, resetting the temperature on an existing water heater, and installing a programmable thermostat on the central heating system.

Refrigerator replacement is particularly effective at reducing

electricity consumption, and delivering fuel bill savings, and CO₂ reductions).

Data reported by DOE in 1997³³⁴ shows positive results for surveys from 1989 and 1996 and increased benefits over the years. The “installation benefit/cost ratio,” reported at 2.39 (up from 1.58 in 1989), verifies the effectiveness of the programs. These increased benefits will be amplified given current energy costs. In fact, by 1996 a savings of 33% was demonstrated for gas space heat consumption. At that time, the household savings were almost \$200/year, and compared with the data reported in 2002 above, savings are still on the rise.

Another report, from the American Council for an Energy Efficient Economy written in 1997,³³⁵ discusses city, state and utility policy instruments for achieving energy efficiency in existing homes and rentals, and outlines case studies on Residential Energy Conservation Ordinances (RECO's) and Home Energy Ratings Systems (HERS).

³³¹ Habitat for Humanity has a how to guide to make homes more energy efficient, www.habitat.org/env/energy_bulletins.aspx, 3 October 2006.

³³² “Meeting the Challenge: The Prospect of Achieving 30 Percent Energy Savings through the Weatherization Assistance Program”, M. Schweitzer & J.F. Eisenberg, Oak Ridge National Laboratory, weatherization.ornl.gov/pdf/Con-479%20May22-FINAL.pdf. Summary of key findings, table, p. 13, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Residential/Weatherization_2002.pdf, 3 October 2006.

³³³ Ibid. p. 14.

³³⁴ Progress Report of the National Weatherization Assistance Program, 1997, ORNL, www.eere.energy.gov/weatherization/pdfs/con450.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Residential/ORNL_weatherization.pdf, 3 October 2006.

³³⁵ American Council for an Energy Efficient Economy, Report Overview of “Policy Options for Improving Existing Housing Efficiency, 1997. www.aceee.org/pubs/a971.htm, 3 October 2006.

CASE STUDY: Moose Jaw, Canada

In late 2005, volunteers in Moose Jaw, Saskatchewan, organized Share the Warmth Home Energy Efficiency Program to help low-income families get ready for winter. Community volunteers and students from the Saskatchewan Institute of Applied Science and Technology helped 100 low-income families. Students applied techniques and concepts learned in the classroom. The free improvements—valued at more

than \$200 plus installation for each home—include preparing windows and doors for winter, replacing furnace filters, installing a working smoke detector, putting in low-flow shower heads and faucets, installing compact florescent lights and installing an ENERGY STAR® programmable thermostat.³³⁶ The program is set to happen again in 2006, with 500 homes to be chosen. Anyone can apply, but preference is to be given to

homes with annual incomes of \$45,000CN or less. The average savings for each home is reported at about \$150 a year on energy and water bills.³³⁷

CONTACT

Manager, Communications
Dave Burdeniuk
SaskEnergy
(306) 777-9842

CASE STUDY: Seattle, WA

The city of Seattle offers a free weatherization assessment and remedy program to qualifying homeowners as part of their HomeWise loan program. The program can weatherize low-income single family homes and in some cases apartment buildings. A "property rehabilitation specialist" comes to the home and recommends a conservation package that fits the needs of that home.

Services provided include: attic and crawlspace insulation, pipe wrapping, weatherstripping doors, caulking windows and using high-efficiency lighting in common areas.³³⁸ The cities of Berkeley, California, and Boulder, Colorado, have similar programs.³³⁹ In Boulder, volunteers go door to door to offer residents a free efficient light bulb, and information on how to get their houses audited.

CONTACT

Seattle Contact
(206) 684-0721
Seattle.Housing@seattle.gov

Berkeley Contact
(510) 981-5434
Energy@ci.berkeley.ca.us

³³⁶ Saskatchewan Energy Share, www.skenergyshare.com/share_the_warmth.htm, 3 October 2006.

³³⁷ SaskEnergy Share the Warmth Media Release, www.siastr.sk.ca/departments/mktgcomms/pdf05/sharethewarmthday.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Residential/MooseJaw_sharethewarmth.pdf, 3 October 2006.

³³⁸ Seattle Office of Housing, www.seattle.gov/housing/06-HomeWise/HomeRepair&.htm, 5 October 2006.

³³⁹ Berkeley Office of Energy and Sustainable Development, www.ci.berkeley.ca.us/sustainable/, 5 October 2006.

CASE STUDY: Dearborn, MI

In Dearborn, Michigan low-income home owners and renters are eligible to apply for Weatherization Program (WX) assistance through the Wayne-Metropolitan Community Action Agency (WMCAA). Examples of eligible work include sidewall insulation, weather-stripping doors and windows, broken glass

repair, furnace inspection and tune-up, caulking doors and windows, attic insulation and ventilation, crawl space insulation and box sill insulation.³⁴⁰ A pre-inspection and blower door test will determine the specific measures to be installed by private contractors.

CONTACT

Wayne Metropolitan Community Action Agency
(734) 246-2280

City Of Dearborn Economic and Community Development Department
(313) 943-2180

CASE STUDY: Portland, OR

The city of Portland offers a loan program through the Portland Development Commission (PDC) for home improvements including energy efficiency upgrades. The loans are up to \$20,000 with low-interest and deferred-payment and are available for income-qualified homeowners. The Community Action Program (CAP) is a county-level program for lower-income weatherization assistance. Each county administers a CAP to offer free weatherization services to low-income households. Both single-family homes and multi-unit complexes may be eligible. Priority is given to households with young children, senior citizens and people with disabilities.³⁴¹

The Portland Office of Sustainable Development also provides free assistance to property owners (of multifamily units) to achieve energy efficiency and financial savings through weatherization. Their customer service specialists educate the multifamily community about energy efficiency and help property owners and managers apply for valuable incentives from the Energy Trust of Oregon, Inc. and the Oregon Department of Energy. Through innovative public-private collaboration, the Office of Sustainable Development Multifamily Energy Assistance Program promotes and administers the Multifamily Home Energy Savings program

for Energy Trust of Oregon. The Multifamily Home Energy Savings program provides property owners with cash incentives for purchasing and installing energy efficient weatherization measures, such as new energy efficient windows; ceiling, floor and wall insulation, low-flow showerheads and more. They also assist property owners in applying for Business Energy Tax Credits from the Oregon Department of Energy.³⁴²

CONTACT

Neil Fitzgerald
PDC 222 NW Fifth Ave.
Portland, OR 97209-3859
(503) 823-3200

³⁴⁰ Dearborn Home Weatherization Program, www.cityofdearborn.org/departments/economicdev/wx.shtml, 5 October 2006. Program funding provided through the State of Michigan Department of Human Services.

³⁴¹ Contact each county for information:
Multnomah 503-248-3999, ext. 22816
Washington 503-648-6646
Clackamas 503-534-5500

www.portlandonline.com/osd/index.cfm?c=41816&a=111233, 3 October 2006.

³⁴² Portland Multi-Family Home Energy Savings, www.portlandonline.com/osd/index.cfm?&a=111266&c=41818, 3 October 2006.

Split Incentives in Renter Occupied Homes

Energy efficiency in rental homes is neglected by many parties on both sides of the owner/renter relationship since neither party has an economic incentives to make energy-efficient improvements. In most cases, rental home owners are not the ones who pay for utilities, this falls to the renters. However, the renters generally get no payback

for capital improvements to the home they are renting for relatively short periods. Owners of rental property get federal tax write-offs for *repairs* made to a rental property, but not for *improvements* (the opposite is true of an owner-occupied home). Businesses and commercial real estate may benefit from local tax incentives, but local (city) taxes usually do not affect the rental homeowner significantly, making city tax incentives less attractive to that group. Thus both groups are lacking in incentives to make improvements to the home that increase energy efficiency.

Several interesting projects are attempting to address this problem. They range from business tax incentives, to performance contracting, time-of-sale efficiency standards ordinances, rebate programs and rental efficiency ratings. Also, in many larger cities a public housing authority may be the largest landlord in town. This offers an opportunity for the central municipal government to make changes to a large number of rental properties directly.

Split Incentives in Renter-Occupied Homes

CASE STUDY: State of Maine

A Maine program³⁴³ requires landlords to fill out an “Energy Efficiency Disclosure Form”³⁴⁴ that lists components, such as insulation or heating fuel types, in rental properties relevant to the amount of energy that the property is likely to use.

Landlords must submit such a form for each of their rental properties. They are not required to meet any standards. However, the energy efficiency standards provide guidance to improve the efficiency of rental properties.

CONTACT

Efficiency Maine
(866) 376-2463
efficiencymaine@maine.gov

³⁴³ Efficiency Maine, www.efficiencymaine.com, 5 October 2006.

³⁴⁴ Maine Energy Efficiency Disclosure Form www.maine.gov/mpuc/doing_business/forms/FactSheet_000.doc, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Residential/Maine_EERentals.doc, 3 October 2006.

CASE STUDY: State of Vermont³⁴⁵

Performance contracting is one approach to the problem of split incentives in rental homes. Financial risk for the energy efficiency improvements is assumed by an energy services company, whose payback comes from the recipient of the improvements, out of his or her energy savings. The Vermont Energy Investment Corporation (VEIC)³⁴⁶ provides financing, technical expertise, reliable information and direct installation of energy efficiency measures. They have a partnership with Vermont Housing Finance Agency.

VEIC operates an energy services company (ESCO) that has long-term relationships with building owners to implement energy efficiency measures. This works as an *energy services company*, through *performance contracting*. VEIC assumes the financial risk for projects and is paid out of the energy cost savings. Basically, the ESCO sells efficiency and clients pay for the ESCO's improvements out of the lowered energy bills. The client's payments to ESCO are based on a percentage of the measured energy cost savings.

This program uses creative financing through the Vermont Housing Finance Agency. In the 80s and 90s, this agency launched programs to help owners of subsidized multi-family housing boost the energy efficiency of their buildings. This worked by setting aside "project cost escrow funds" at the time of the original financing that were held for 7-10 years to be used for necessary repairs and improvements. The catch is that at the time of spending the money, an energy audit is required; and if energy efficiency improvements are identified, the owners are encouraged to make those repairs using the money out of the energy savings.

The split-incentive created in a rental unit is further addressed in Burlington through a time-of-sale ordinance requiring minimum energy efficiency standard be met at each sale of the property (RECOs, or residential energy conservation ordinances). At the time of sale an energy audit must be performed and the buyer or seller may bring the property into compliance. If it is the buyer, he or she has one year to bring the property into compliance. The

Burlington Electric Utility administers the ordinance and also consults on financing, technical assistance and how to go beyond the minimum requirements. This is being phased in over time (only covering a portion of the city of Burlington in 2006) and will be phased in to all of Burlington in 2 years following a report to the city council.

Most tenants in the region move after one year in each residence, with over half citing high energy costs as a reason for the move. With increased efficiency (mandated by the ordinance) tenants may stay longer. Improvement costs may be passed on through higher rents, but these should be offset by lower utility bills (which in a way takes advantage of the split-incentive). This leads nicely to the next incentive, making energy efficiency transparent to the renter.

CONTACT

Vermont Energy Investment Corporation
255 South Champlain Street
Burlington, VT 05401-4717
(802) 658-6060
beth@veic.org

³⁴⁵ EPA Climate Change Solutions, [yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BWJ4R/\\$File/vermonttrimsenergybills.pdf](http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BWJ4R/$File/vermonttrimsenergybills.pdf), also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Residential/Vermont_climate.pdf, 3 October 2006.

³⁴⁶ Vermont Energy Investment Corporation, www.veic.org/, 12 October 2006.

Split Incentives in Renter-Occupied Homes

CASE STUDY: Allegheny, PA

The idea behind the Allegheny College project³⁴⁷ is to make energy efficiency visible to the renter/consumer. Beginning in 1998, The Commonwealth Community Energy Project, formerly The Meadville Community Energy Project,³⁴⁸ developed a local Home Energy Ratings System. One of the first goals of the program was to evaluate the energy usage of Meadville's many rental properties. Data on houses' insulation levels, air

leakage, heating system efficiency and other property features was collected and then used to determine a rating. Energy audits leading to an efficiency rating allow the prospective renter to shop for a rental with the best total cost—rent *and* utilities. The landlords were given suggestions on how they increase efficiency in their properties and their costs, as well as a low-interest loan program for making the improvements.

An education system was designed for renters to explain what the ratings mean and simple things they can do to save energy. The program estimated that changes in the 50 properties rated over the past four years have resulted in a savings of \$30,000 annually.³⁴⁹

CONTACT

Mike Maniates
(814) 332-2986

Split Incentives in Renter-Occupied Homes

CASE STUDY: Lake Champlain, VT

If renters in the Lake Champlain Valley region of Vermont qualify (low-income), the Champlain Valley Weatherization Service (CVWS) will pay for weatherization to the rental home. It ends up at little or no

cost to the owner. It is part of the Champlain Valley Office of Economic Opportunity, which is "funded through a variety of grants, service contracts and donations."³⁵⁰

CONTACT

Production Coordinator
Doug Williams
Champlain Valley Weatherization Service
802-524-6804

³⁴⁷ Meadville Community Energy Project (MCEP), based at Allegheny College homeenergy.org/archive/hem.dis.anl.gov/eehem/00/000706.html, 5 October 2006.

³⁴⁸ Commonwealth Community Energy Project, energy.allegheny.edu/, 30 October 2006.

³⁴⁹ Allegheny newsletter, onthehill.allegheny.edu/autumn02/mcep.html, 5 October 2006.

³⁵⁰ Champlain Valley Weatherization Service www.cvoo.org/wx/rentalpropownwx.htm, 3 October 2006.

CASE STUDY: State of New York

The Assisted Multifamily Program (AMP) provides a range of incentives to owners of publicly assisted, multifamily buildings in New York State to pay for energy efficiency improvements. Services include

energy assessments, financing to complete the improvements, coordination with housing authorities, contractor oversight, and 3 years of energy monitoring afterward.³⁵¹

CONTACT³⁵²

Cary Hirschstein
Hamilton, Rabinovitz & Alschuler, Inc
(212) 977-5597 Ext.237
chirschstein@ny.hra-inc.com

CASE STUDY: San Diego, CA

San Diego Gas and Electric Multi-family rebate is a program designed to mitigate the split incentive by going directly to the owner/manager. Incentives are

offered to the owner/manager directly to upgrade equipment; it offsets the incremental cost of purchasing this equipment.³⁵³

CONTACT

Ila Homsher
Pacific Gas and Electric Energy Efficiency Program
Statewide Multi-family Rebates
(415) 973-3288

Home Size Restrictions, Taxing Large Residential Energy Consumers

Some communities face issues with residents building large square-footage homes. In resorts especially, these trophy homes see little use, and yet remain

heated and cooled year-round. Add such amenities as heated driveways (which can double a home's energy use), outdoor pools and hot tubs, and the community's carbon footprint can soar. Even good enforcement of energy efficiency codes may lose out to the sheer size of the energy needs of such large spaces, and luxurious amenities. Large houses, defined

as being in excess of 5,000square feet, create environmental and social impacts. They require more resources to build and more energy to operate. They impact view sheds and wildlife habitats. Large, widely dispersed houses increase costs to existing taxpayers in services as well. Ordinance tactics in use include energy mitigation programs and size caps on home construction.³⁵⁴

³⁵¹ New York Energy Smart www.getenergysmart.org/WhereYouLive/AssistedHomePerformance/overview.asp, 3 October 2006.

³⁵² The AMP is a grant program implemented by Hamilton, Rabinovitz & Alschuler, Inc. on behalf of NYSERDA. This is the contact person listed for the AMP program and can be found at this website:

www.dsireusa.org/library/includes/GenericIncentive.cfm?Incentive_Code=NY23F¤tpageid=3&EE=0&RE=0, 3 October 2006.

³⁵³ San Diego Multifamily Rebate and Service, www.sdge.com/residential/multi_family.shtml, 3 October 2006.

³⁵⁴ Discussion of these claims, relative to Gunnison County, CO, www.hccaonline.org/page.cfm?pageid=2053, 3 October 2006.

CASE STUDY: Aspen, CO (Pitkin County)³⁵⁵

In 2000, Aspen and Pitkin County established the Renewable Energy Mitigation Program (REMP)³⁵⁶ as a way of promoting renewable energy and energy efficiency. Pitkin County and the city of Aspen building codes require new homes to meet a strict energy "budget."

The code regulates the amount of grid-tied energy used for big energy consumption in the community: melting snow, spas, swimming pools and houses over 5,000 and 10,000 square feet. The energy for these uses must fit within a prescribed energy budget, or 50% of this energy can be supplied by on-site renewable energy systems. Under the Energy Code, the REMP allows for the payment of a mitigation fee instead of

installing on-site renewable energy systems. In addition, houses over 5,000 square feet are required to install a renewable energy system on site or pay a fee of \$5,000. The fee for houses over 10,000 square feet is \$10,000.

The Community Office for Resource Efficiency (CORE) manages the REMP funds with oversight from others.³⁵⁷

REMP Fees support an incentive program that leverages private investments in renewable energy and energy efficiency. Portions of the fees also provide funds for renewable energy and energy efficiency technologies in public buildings and affordable housing. All projects are subject to

approval by the city of Aspen and Pitkin County. In its first 2 years, the fund accumulated approximately \$1.5 million, ten times the expectation, and by March 2006 had collected about \$5.1 million.

In 2006 Pitkin County passed a further code restricting the size of homes built there. A 15,000 sq. ft cap on homes is now in effect, with a limit on urban homes to 5,750 sq. ft. Several loopholes in the previous code were also removed.³⁵⁸

CONTACT

Environmental Health
Department
(970) 920-5075
globalwarming@ci.aspen.co.us

CASE STUDY: Marin County, CA

Marin County, California passed a similar ordinance in October 2002. The goals of Ordinance 3356³⁵⁹ are to reduce the annual and peak energy consumption of large homes, and to ensure that a new single family home larger than 3,500 square feet does not

exceed the energy use of the Title 24 standard of the equivalent home designed at 3,500 sq. ft. This can be achieved with readily available energy efficiency measures and/or by supplementing energy use with renewable energy.³⁶⁰

CONTACT

Alec Hoffmann
BEST program Coordinator
(415) 507.2659
ahoffmann@co.marin.ca.us

³⁵⁵ Aspen Canary Initiative, www.aspenglobalwarming.com/, 3 October 2006.

³⁵⁶ Aspen and Pitkin County REMF Program, www.newrules.org/environment/climateaspen.html, 30 October 2006.

³⁵⁷ CORE, REMF Projects, www.aspencore.org/sitepages/pid56.php, 30 October 2006.

³⁵⁸ Interview with Pitkin County community development director Cindy Houben: www.kcfr.org/cgi-bin/comatters/comatters_play.aspx?play=2473&type=comatters.aspx.

³⁵⁹ Marin County Energy Efficiency Ordinance, www.caleep.com/docs/resources/greenbuildings/Marin%20County%20Res%20EE%20Ordinance.pdf#search=%22marin%20county%20home%20size%20square%20feet%22, also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Residential/Marin_Ordinance3356.pdf, 5 October 2006.

³⁶⁰ Marin County Community Development Agency, www.co.marin.ca.us/depts/CD/main/comdev/advance/best/dwelling.cfm, 5 October 2006.

Energy and Water Efficiency by Smart-Metering, Price Signals and Price Structuring

Energy use fluctuates throughout the day by hour, and by day of the week. Wholesale energy prices usually vary according to peak demand cycles. Allowing consumers to easily see how much energy they are using, and what the real-time prices are enables residents to vary their energy use according to demand cycles and fluctuations in price. Doing this lowers energy use, cuts consumer bills and dampens price fluctuations.

So-called “smart-meters” provide a feedback loop between customers and suppliers to regulate usage according to price signals. The aim of smart-metering is to change consumers' behavior as they become aware of how they use energy and what this is costing them.³⁶¹

Currently, consumers purchase energy for their homes unaware of the unit costs at the time of use. Most consumers can only find out the cost (on their bill), long after they could have changed their consumption patterns. Smart metering would alert consumers to peak and off-peak prices at the time they are happening, allowing them to help the utility

reduce peak demand. In some cases, appliances are also programmed by the consumer to shut off according to utility system load and price signals. Many states are leading the way by recommending the development and dispersal of smart meters and removing any barriers that have previously existed.³⁶²

Innovative Electrical Metering

In early 2006, Pacific Northwest National Laboratory began testing the Pacific Northwest GridWise™ Demonstration project, a regional initiative to test and speed adoption of new smart grid technologies to make the power grid more resilient and efficient. About 300 volunteers in Washington's Olympic Peninsula, in Yakima and Gresham, Oregon are testing the system for a year. Approximately 200 homes will receive real-time price information through a broadband Internet connection. Automated equipment will adjust energy use based on price. In addition, some customers will have computer chips embedded in their dryers and water heaters that can sense when the power transmission system is under stress and automatically turn off certain functions briefly until the grid can be stabilized by power operators. The year-long study is

part of the Pacific Northwest GridWise Demonstration, a project funded primarily by DOE. Northwest utilities, appliance manufacturers and technology companies are supporting this effort to demonstrate the devices and assess the resulting consumer response. In the pricing study, automated controls will adjust appliances and thermostats based on predetermined instructions from homeowners. The volunteers can choose to curtail or reduce energy use when prices are higher. At any point, homeowners have the ability to override even their preprogrammed preferences to achieve maximum comfort and convenience. If homeowners choose to reduce electric consumption at times of higher prices, the banked money they save becomes real as they are issued a check from the GridWise program each quarter. Price conscious participants are expected to earn about \$150 during the year. Nobody will lose money during the experiment, but higher prices for peak usage could become a feature in the future.

A PNNL study shows that creating a smarter grid through information technology could save \$80 billion over 20 years nationally by offsetting costs of building new electric infrastructure – the generators,

³⁶¹ Informational articles: seattletimes.nwsources.com/html/business/technology/2002734592_smartgrid12.html, 5 October 2006
news.bbc.co.uk/2/hi/science/nature/4754109.stm, 5 October 2006.
www.americanenergyindependence.com/smartmeters.html, 5 October 2006.

³⁶² On August 1st, 2006 the New York Public Service Commission issued an order to support utility investment in advanced metering technology, [www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/ArticlesByCategory/BDD11878B2AC5A98852571B20061CF54/\\$File/94e0952_ord_08_01_06.pdf](http://www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/ArticlesByCategory/BDD11878B2AC5A98852571B20061CF54/$File/94e0952_ord_08_01_06.pdf), also archived at, www.climatemanual.org/Cities/Chapter5/BestBets/Infrastructure/NYOrder_metering_2006.pdf, 5 December 2006.

transmission lines and substations that will be required to meet estimated load growth.³⁶³ It would also save significant carbon emissions.³⁶⁴

Additional Resources

EnergySavers.gov information clearinghouse:

www.energysavers.gov/stateagencies.html

Alliance to Save Energy:

www.ase.org/section/program

Renewable energy programs for public utilities:

www.dnr.mo.gov/energy/utilities/Summary%20031203BW.doc, p. 13

Sample resolution for energy efficiency:

www.cabq.gov/energy/documents/Resolution329.doc

Article on cities and counties leading the energy-efficiency charge

www.americancityandcounty.com/mag/government_energy_efficiency_taking/index.html

Residential high-rise in NYC

www.thesolaire.com/

Habitat for Humanity partners with the Department of Energy to build energy efficient homes and improve existing homes.

www.nrel.gov/docs/fy05osti/38116.pdf

Habitat for Humanity also has a program called “**Better Built Program**”, which provides contacts, materials and resources for local Habitat affiliates who seek help in building more sustainable houses

www.habitat.org/env/better_built.aspx

Energy Efficient Home Article Resource Directory

Database of articles on energy efficient homes. Provides practical and clear information for the homeowner.

www.energyefficienthomearticles.com/

“Creating a High Performance Workspace” G/Rated Tenant Improvement Plan, 2004. This guide has been created by the City of Portland and the City of Beaverton Solid Waste &

Recycling Program to support and promote healthy, productive, durable, resource- and energy efficient workspaces. This is a good resource for commercial building owners, because it details the action strategies for the project manager, design and construction team to build an efficient and healthy workspace.

www.portlandonline.com/shared/cfm/image.cfm?id=112733

ENERGY STAR® Change a Light Change a World Campaign

The ENERGY STAR® Change a Light, Change the World Campaign is a national call-to-action to encourage individuals to help change the world, one light—one energy-saving step—at a time. Individuals who already pledged in 2005 will help save more than \$2 million in energy costs and prevent more than 33 million pounds of greenhouse gas emissions. The Environmental Protection Agency, Department of Energy, and Department of Housing and Urban Development are pleased to partner to sponsor the Campaign this year

www.energystar.gov/index.cfm?c=change_light.changealight_about

Smart Energy Living is an informational resource provided by Colorado Energy Science Center. Smart Energy Living brings together the information, resources and tools to help you understand how to reduce your energy use and save money. We publish a semi-annual magazine, offer workshops, provide online information, and links to contractors.

smartenergyliving.org/cm/Home.html

³⁶³ Pacific Northwest National Laboratory, www.pnl.gov/news/2006/06-01.stm, 3 October 2006.

³⁶⁴ For more information contact: 1-888-375-PNNL or inquiry@pnl.gov, 3 October 2006.

A Primer on Smart Metering,
New York State Energy Research
and Development Authority
[www.nyserda.org/programs/pdfs/
meteringprimer.pdf](http://www.nyserda.org/programs/pdfs/meteringprimer.pdf)

The Home Resource Profile is a
detailed, customized report that
shows you how your household
uses energy, water and solid
waste. It is available to any
Seattle City Light or Seattle
Public Utilities residential
customer. Whether you live in a
house, condominium or
apartment, this free service will
give you useful information
about your utility bills and how
to save money
[www.cityofseattle.net/conserve/h
omeprofile/](http://www.cityofseattle.net/conserve/homeprofile/)

**City of Seattle Energy Savings
Tips Directory.** These energy
savings tips are from *30 Simple
Energy Things You Can Do to
Save the Earth* authored by
Seattle City Light and The
EarthWorks Group.
[www.cityofseattle.net/light/conse
rve/tips/](http://www.cityofseattle.net/light/conserve/tips/)



NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548

Chapter 5: Local Action Plan Best Bets Residential Transportation

DOCUMENT CONTENTS³⁶⁵

Make City Pedestrian-Friendly and Bicycle-Friendly	125
CASE STUDY:	
Toronto, Canada	126
Implement School and Campus Transportation Programs	127
CASE STUDY: Stanford, CA	128
Encourage or Require Implementation of Commute Trip Reduction Programs	129
Benefits and Costs	130
CASE STUDY:	
Trip Reduction Ordinances	131
Implement Parking Management Programs	132
How to Implement	133
Parking Management Benefits	134
CASE STUDY: Chattanooga, TN	134
Better Public Transportation	135
CASE STUDY: Boulder, CO	136
Car Sharing Programs and Installation of Park and Ride Facilities	137
Rideshare	137
CASE STUDY:	
King County, WA	138
Park and Ride	138
CASE STUDY:	
Space Coast Area Transit, Florida	139
Location Efficient Mortgages	139
Travel Impacts	140
CASE STUDY: Denver, CO	141
Provide Incentives for Hybrid and Low Emission Vehicle Use	142
CASE STUDY: Ferndale, MI	142
Additional Resources	143

Most of the best practices for transportation in this section focus on how municipalities use incentives to encourage residents and businesses to modify their transportation uses.

Motor vehicles are major greenhouse gas (GHG) emitters and sources of air, noise and water pollution. Transportation represents about 27% of total U.S. energy consumption and 70% of total petroleum consumption.³⁶⁶ Transportation energy consumed by mode is summarized below. Personal

transportation represents about 60%, and commercial transport about 40% of total transportation energy consumption.

“Transportation Demand Management” (TDM) is a term used to describe strategies that result in more efficient uses of transportation resources. Below are highlighted some of the best practices that cities can use to decrease GHG emissions and increase the mobility of the community.

	Trillion BTUs	% of Total Consumption
Automobiles	9,126	34%
Light Trucks (including vans and SUVs)	6,617	25%
Trucks & Private Buses	4,563	17%
Aviation	2,546	10%
Water	1,300	4.9%
Pipeline	1,009	3.8%
Off-highway (construction and agriculture)	680	2.5%
Railroads	607	2.3%
Buses	207	0.8%
Motorcycles	26	0.1%

Table: Vehicle Energy Use³⁶⁷

³⁶⁵ All of the information in this section can be found at Victoria Transportation Policy Institute, unless otherwise noted.

³⁶⁶ ORNL, *Transportation Energy Book*, Oak Ridge National Laboratories, U.S. Department of Energy.

Make City Pedestrian-Friendly and Bicycle-Friendly

Improve walking and cycling conditions. Establish local walking and cycling plans and fund sidewalk and bike-lane improvements.³⁶⁸

According to some estimates, 5-10% of urban automobile trips can reasonably be shifted to non-motorized transport.³⁶⁹ Shifts from automobile to non-motorized transportation can be

particularly effective at energy conservation and emission reductions as short motor vehicle trips have high per-mile fuel consumption and emission rates. Each 1% shift of mileage from automobile to non-motorized modes tends to reduce energy consumption and pollution emissions by 2-4%.

Moreover, a short pedestrian or cycle trip often replaces a longer automobile trip (for example, consumers may choose between shopping at a local store or driving to a major shopping center). Non-motorized

transportation improvements are also increase transit use and create more pedestrian accessible land use patterns.³⁷⁰

Studies have found that in many communities people would walk more frequently if they had suitable facilities and resources. One U.S. survey found that 38% of respondents would like to walk to work, and 80% would like to walk more for exercise.³⁷¹

The table below summarizes a Canadian public survey indicating high levels of interest in cycling and walking.

Description	Cycle	Walk
Currently use this mode for leisure and recreation.	48%	85%
Currently use this mode for transportation.	24%	58%
Would like to use this mode more frequently.	66%	80%
Would cycle to work if there "were a dedicated bike lane which would take me to my workplace in less than 30 minutes at a comfortable pace."	70%	NA
Support for additional government spending on bicycling facilities.	82%	NA

Table: Active Transportation Survey Findings³⁷²

However, citizens' ability to walk or cycle depends on city planning. The Victoria Transportation Policy Institute³⁷³ estimates that pedestrian-friendly

communities have 5-10 times as many non-motorized trips compared to automobile dependent communities with otherwise similar demographic

and geographic conditions.

Best practices for improving walkability and encouraging walking, include:³⁷⁴

³⁶⁷ Ibid, Table 2.5.

³⁶⁸ Victoria Transportation Policy Institute, www.vtpi.org/tdm/tdm92.htm, 26 September 2006.

³⁶⁹ Victoria Transportation Policy Institute, www.vtpi.org/tdm/tdm92.htm, 3 October 2006.

³⁷⁰ Victoria Transportation Policy Institute, www.vtpi.org/tdm/tdm84.htm, 3 October 2006.

³⁷¹ STPP, *Americans Attitudes Toward Walking and Creating More Walkable Communities*, Surface Transportation Policy Project (www.transact.org), 2003.

³⁷² Environics, *National Survey on Active Transportation*, Go for Green, (www.goforgreen.ca), 1998. *This survey indicates a high level of interest in cycling and walking.*

³⁷³ Victoria Transportation Policy Institute, www.vtpi.org/tdm/tdm100.htm, 3 October 2006.

³⁷⁴ A number of guides and resources provide information about best practices:

- 1) ADONIS, *Best Practice to Promote Cycling and Walking and How to Substitute Short Car Trips by Cycling and Walking*, ADONIS Transport RTD Program, European Union (www.cordis.lu/transport/src/adonisrep.htm), 1999. This 300-page catalogue describes dozens of strategies to help improve and encourage walking and cycling, ranging from special facilities, to safety campaigns and traffic management to facilitate street crossing).
- 2) Todd Litman, et al., *Pedestrian and Bicycle Planning: A Guide to Best Practices*, VTPI (www.vtpi.org), 2000. Comprehensive guide with extensive references.
- 3) Zeeger, et al, *Pedestrian Facilities User Guide: Providing Safety and Mobility*, Pedestrian and Bicycle Information Center (www.walkinginfo.org), Highway Safety Research Center, Federal Highway Administration, Publication FHWA-RD-01-102, February 2002.
- 4) GDOT, *Pedestrian & Streetscape Guide*, Georgia Department of Transportation (www.dot.state.ga.us), Sept. 2003.

Integrate non-motorized transportation into all transport and land-use planning activities.

Educate city planners in non-motorized transportation planning principles.

Increase funds for non-motorized planning relative to the rates of funding for automobile infrastructure.

Insure that all roadways are suitable for walking unless it is

specifically prohibited and suitable alternatives are available.

Use current planning practices and design standards, including facility designs that accommodate the widest range of potential users, including people with mobility and visual impairments (disabilities) and other special needs.

Include non-motorized travel in transportation surveys and models.

Create pedestrian-oriented centers and neighborhoods.

Perform user surveys to identify problems and barriers to pedestrian travel.

Use design features and strategies intended to reduce vehicle traffic speeds and volumes on a particular roadway, and other traffic control measures to make street environments safer and more pleasant for walking.³⁷⁵

Pedestrian & Bicycle Friendly City

CASE STUDY: Toronto, Canada

The City of Toronto adopted a Pedestrian Charter³⁷⁶ in October 2002 and was the first city in North America to have such a charter. It reflects the concept that walkability is one of the most important measures of the quality of a city's public realm, its health and vitality. The Charter serves as a guide to decision-makers, both in the city and in the community at large that walking should be valued as the most sustainable of all forms of travel, and that it has enormous social, environmental and economic benefits. It outlines what pedestrians can rightfully expect from the city in terms of meeting their travel needs; to establish principles to guide the development of policies and

practices that affect pedestrians; and to identify the features of an urban environment and infrastructure that encourage and support walking. The Charter consists of six principles:

1. Accessibility: Walking is a free and direct means of accessing local goods, services, community amenities and public transit.
2. Equity: Walking is the only mode of travel that is universally affordable, and allows children and youth, and people with specific medical conditions to travel independently.
3. Health and Well-being: Walking is a proven method of promoting personal health and well-being.

4. Environmental Sustainability: Walking relies on human power and has negligible environmental impact.
5. Personal and Community Safety: Walking increases community safety for all by creating an environment in which people feel safe and comfortable.
6. Community Cohesion and Vitality: A pedestrian-friendly environment encourages and facilitates social interaction and local economic vitality.

CONTACT

Pedestrian and Cycling Infrastructure
(416) 392-5230
pedplan@toronto.ca

³⁷⁵ For more information on 'traffic calming' techniques see: www.vtpi.org/tdm/tdm4.htm, 3 October 2006.

³⁷⁶ Toronto Pedestrian Charter, www.toronto.ca/pedestrian/, 26 September 2006.

Implement School and Campus Transportation Management Programs

School and campus

transportation management programs encourage parents, students and staff to use alternative transportation when traveling to school, college and universities.³⁷⁷

An increasing number of colleges and universities offer free or

significantly discounted transit passes to students and staff (sometimes called a “UPASS”). UPASS programs often require students to approve a special fee to fund universal transit passes. The table below summarizes the costs and impacts of several UPASS programs.

University	Year Began	Who May Ride Free	Eligible Riders	Annual Program Cost	Annual Rides	Cost Per Eligible Person	Rides Per Eligible Person	Average Cost per Ride	Ridership Increase
			(1)	(2)	(3)	(4)=(2)/(1)	(5)=(3)/(1)	(6)=(2)/(3)	(7)
UC, San Diego	1969	Students, faculty, staff, emeritus	35,200	\$177,700	296,600	\$5	8	\$0.60	
University of Georgia at Athens	1977	Students	30,000	\$275,000	600,000	\$9	20	\$0.46	
Cal Poly State, San Luis Obispo	1985	Students, faculty, staff, emeritus	17,500	\$169,000	531,700	\$10	30	\$0.32	
Appalachian State University, NC	1980	Students, faculty, staff	13,200	\$251,000	361,800	\$19	27	\$0.69	
University of Pittsburgh, PA	1995	Students, faculty, staff	31,200	\$650,000	1,536,900	\$21	49	\$0.42	60%
UC, Santa Barbara	1986	Students	17,400	\$400,200	584,800	\$23	34	\$0.68	6%
Santa Barbara City College, CA	1995	Students	12,000	\$277,000	525,500	\$23	44	\$0.53	36%
University of Massachusetts at Amherst	1969	Students, faculty, staff	39,000	\$972,300	807,500	\$25	21	\$1.20	
Ohio State University	1997	Students	48,300	\$1,400,000		\$29			300%
University of Wisconsin at Madison	1996	Students	39,000	\$1,200,000	1,600,000	\$31	41	\$0.75	
Virginia Polytechnic Institute and State University	1983	Students, faculty, staff	32,000	\$1,100,000	1,400,000	\$34	44	\$0.79	
Auraria Higher Education Center (UC Denver)	1994	Students	31,500	\$1,204,000	1,965,000	\$38	62	\$0.61	
UC, Davis	1990	Students	18,500	\$719,000	1,800,000	\$39	97	\$0.40	255%
San Jose State University, CA	1993	Students	27,000	\$1,060,000		\$39			
UC Boulder	1991	Students, faculty, staff	24,500	\$1,000,000	1,500,000	\$41	61	\$0.67	400%
Marquette University, WI	1995	Students	6,700	\$400,000		\$60			
University of Illinois at Urbana-Champaign	1989	Students	36,000	\$2,200,000	5,800,000	\$61	161	\$0.38	370%
University of Wisconsin at Milwaukee	1994	Students	20,200	\$1,247,400	2,300,000	\$62	114	\$0.54	27%
UC, Santa Cruz	1972	Students, faculty, staff	12,220	\$1,203,800	1,253,047	\$99	103	\$0.96	
AVERAGES						\$32	56	\$0.57	

Table: UPASS Program Summary³⁷⁸

³⁷⁷ Victoria Transportation Policy Institute, www.vtpi.org/tdm/tdm5.htm, 26 September 2006.

³⁷⁸ Jeffrey Brown, Daniel Hess and Donald Shoup, *Unlimited Access*, Institute of Transportation Studies, UCLA, 1998. Published in *Transportation*, Volume 28, number 3, 2001, pp. 233-267. www.vtpi.org/tdm/tdm5.htm, 18 October 2006.

Students at the following universities voted overwhelmingly (most referenda received 75% or more approval) to support many of these programs, even though it increases their fees. The table on the next page summarizes some campus UPASS programs in North America.

Some campuses use vehicle restrictions³⁷⁹ and regulations to limit automobile use. For example, some colleges do not provide parking permits to freshmen who live on campus. This encourages students to become more involved in campus activities, and discourages them from taking jobs to finance a car.

Facility managers and administrators often implement campus TDM programs to address a particular problem, such as a parking shortage or traffic congestion on nearby

streets. Student and employee organizations are often involved in program planning and management. Some student groups initiate programs to improve their travel options and achieve environmental or community goals.

Campus TDM programs can reduce automobile trips by 10-30%.³⁸⁰ For example, a program at the University of Wisconsin-Milwaukee reduced student driving by 26%.³⁸¹ A University of Washington program reduced total vehicle trips to campus by 16% during its first year of operation.³⁸² A study in Bilbao, Portugal found that students are relatively sensitive to bus prices, rail frequency and overall transit service quality. A combination of increased rail service frequency and reduced bus fares can significantly increase ridership and help reduce local traffic congestion and pollution emissions at campuses.³⁸³

Best practices for Campus TDM programs include:

Provide a variety of alternative transportation services, including specialty services such as transport for recreational trips and special events.

Involve administrators, managers, students and staff in planning and implementing the program.

Emphasize benefits to students and staff from improved transportation services, including financial savings, expanded choice, exercise opportunities (for cycling and walking) and environmental benefits.

Improve pedestrian and bicycle conditions on campus and surrounding areas.

Pedestrian & Bicycle Friendly City

CASE STUDY: Stanford, CA³⁸⁴

Stanford University in Palo Alto, California, expanded its building capacity by 25%, adding more than 2.3 million square feet of research and teaching buildings, public facilities and housing—without increasing peak period vehicle traffic. By 2000, 1.7

million square feet of new buildings had been developed, while automobile commute trips were reduced by 500 per day.

To accomplish this the campus transportation management plan included:

A 1.5 mile transit mall

Free transit system with timed transfers to regional rail

Bicycle network

³⁷⁹ Victoria Transportation Policy Institute, www.vtpi.org/tdm/tdm33.htm, 3 October 2006.

³⁸⁰ Ibid.

³⁸¹ James Meyer and Edward Beimborn, *Evaluation of an Innovative Transit Pass Program: the UPASS*, Wisconsin Department of Transportation (www.uwm.edu/dept/cuts/upassum.htm), 1996.

³⁸² (Michael E. Williams and Kathleen L. Petrait, "U-PASS: A Model Transportation Management Program that Works," *Transportation Research Record* 1404, 1993, pp. 73-81; website: www.washington.edu/upass).

³⁸³ J. Bilbao Ubillos and A. Fernandez Sainz, "The Influence Of Quality and Price On The Demand For Urban Transport: The Case Of University Students," *Transportation Research A*, Vol. 38, No. 8 (www.elsevier.com/locate/tra), October 2004, pp. 607-614; website: www.vtpi.org/tdm/tdm5.htm, 26 October 2006.

³⁸⁴ Stanford University Parking & Transportation Services, transportation.stanford.edu, 26 September 2006.

Staff parking “cash-out” (offering commuters cash equivalent if they choose not to use subsidized parking)

Ridesharing program

Other transportation demand management elements

By using this approach, the campus was able to add \$500 million in new projects with minimal planning or environmental review required for

individual projects. The campus also avoided significant parking and roadway costs. Planners calculate that the university saves nearly \$2,000 annually for every commuter shifted out of a car and into another mode.

Public benefits included decreased congestion and improved safety on surrounding roadways and regional traffic system, reduced air, noise and water pollution, and improved local transit options. All of Stanford’s transportation services

are available to students, employees and the general public.

CONTACT

Parking Operations Director
Brodie Hamilton

TDM Coordinator
Stephanie Manning
(650) 723-9362
transportation@stanford.edu

Encourage or Require Implementation of Commute Trip Reduction Programs

Implementing commute trip reduction (CTR) programs encourages employees to use alternative modes when traveling to work.

CTR³⁸⁵ programs must be able to meet employees’ diverse and changeable needs. Many employees can use transportation alternatives part-time, if given suitable support and incentives. For example, many employees can carpool, telecommute or work part time two or three days a week. Some employees can bicycle commute part of the year, as well.

Some jurisdictions mandate CTR programs for certain types of employers, such as those with more than 50 daytime employees

at urban worksites. These have been criticized as “laws forcing workers to give up their cars,” but that is not true. Such laws only require *employers* to develop a program with suitable incentives, taking into account location and employee requirements. They do not require individual employees to change their commute pattern.

U.S. EPA’s Commuter Choice program³⁸⁶ has established National Standards of Excellence in Commuter Benefits, and the Commuter Choice Leadership Initiative (CCLI) awards. To meet National Standard of Excellence employers must offer:

A guaranteed ride home

Employer-paid transit/vanpool benefits - employer provides at least \$30 per month in benefits or the full value of commuting costs.

Parking Cash Out - employer provides the option of cash instead of parking. CCLI requires the employer to offer at least \$30 per month and at least 75% of the actual saved costs of parking to classify this option as a primary benefit.

Employer-defined benefits—allows employers to use other strategies to achieve the standards.

Employers must achieve demonstrable benefits the Federal Commuter Choice Team must agree if an option is to qualify.

Other TDM incentives are treated as supporting strategies to these primary activities. These include:

Ridesharing or carpool matching

Shuttles from transit stations

³⁸⁵ Victoria Transportation Policy Institute CTR Programs, www.vtpi.org/tdm/tdm9.htm, 26 September 2006.

³⁸⁶ Best Workplaces for Commuters, www.commuterchoice.gov, 3 October 2006.

Preferred parking for carpools/vanpools

Secure bicycle parking, showers and/or lockers

Financial or recognition incentives for bicyclists or walkers

Benefits and Costs

Shifting commute travel from peak period automobile trips to alternative times and modes can provide a variety of benefits

Employee Benefits

CTR programs can benefit employees by increasing their travel options, reducing travel stress and by providing financial savings. Some studies show that many workers place a high value on having commute alternatives.³⁸⁷ Even people who generally enjoy driving do not necessarily want to drive to work every day. At the margin (i.e., relative to current levels of vehicle travel), many consumers would probably prefer to drive somewhat less, provided that

they had good mobility alternatives with adequate comfort, convenience and prestige.

Employer Benefits³⁸⁸

CTR programs can benefit employers by reducing their parking costs or freeing up parking for customers. Programs that improve travel choices or provide financial benefits tend to improve employee morale and recruitment, and reduce employee turnover. For example, employee turnover at the Calvert Group (an investment firm) declined from 25% to 12% after a comprehensive package of commute benefits were introduced, and other surveys find that telecommuting reduces employee turnover by 16%.³⁸⁹

Community Benefits

CTR is particularly effective at reducing traffic congestion since commute trips are the largest share of peak-period travel. It can reduce road, on-street parking and traffic service costs. Along with reducing GHG emissions, it can also help reduce pollution and crash risk, and

increase demand for alternative modes, providing economies of scale. By reducing road and parking facility requirements, it supports more efficient land use, compact development and more pedestrian-oriented streetscapes.

CTR costs

Costs include program administration expenses and any additional employee time requirements.³⁹⁰ Administrative costs typically average \$1-8 per employee per month to cover program planning, marketing, management and evaluation activities.³⁹¹ A survey by Pollution Probe found that the American employers with successful CTR programs spend an average of \$156 annually per employer, with the majority spending \$33 to \$89.³⁹² However, there are also savings and benefits to businesses that may offset much of these costs.³⁹³

Some costs and benefits are economic transfers, in which costs to one group are offset by benefits to another. For example, charging motorists directly for using parking

³⁸⁷ Raymond Novaco and Cheryl Collier, *Commuting Stress, Ridesharing, and Gender: Analyses from the 1993 State of the Commute Study in Southern California*, University of California Transportation Center (Berkeley), Working Paper #208 (www.uctc.net), 1994.

³⁸⁸ The *SMART Trip Reduction Manual* published by Pollution Probe (2001) provides information on calculating the benefits of CTR programs to employers and employees. (www.pollutionprobe.org/Publications/Air.htm), 2001.

³⁸⁹ EPA, *What Employers are Saying About Commuter Benefits*, Report EPA420-F-01-013, U.S. Environmental Protection Agency, 2001.

³⁹⁰ CTR Task Force, *2001 Report to the Washington State Legislature*, Washington State Department of Transportation, Transportation Demand Management Office (www.wsdot.wa.gov/tdm/tripreduction/download/CTR_Report_01.pdf), December 2001, also archived www.climatemanual.org/Cities/Chapter5/BestBets/TransportationResidential/CTR_Report_01.pdf, 26 October 2006.

³⁹¹ Ali Modarres, "Evaluating Employer-Based Transportation Demand Management Programs," *Transportation Research Record A*, Vol. 27, No. 4, 1993, pp. 291-297.

Waldo Lopez-Aqueres, "Employer Trip Reduction Programs: How Costly? Who Pays?" *TDM Review*, Association for Commuter Transportation (tmi.cob.fsu.edu/act/act.htm), 1994.

³⁹² The *SMART Trip Reduction Manual* published by Pollution Probe (2001) www.pollutionprobe.org/Publications/Air.htm, 26 October 2006.

³⁹³ Phil L. Winters and Sara J. Hendricks, *Quantifying The Business Benefits of TDM*, Center for Urban Transportation Research, for the Office of Research and Special Programs, USDOT, www.nctr.usf.edu/html/416-11.htm, 2003, 26 October 2006.

facilities increases costs to automobile commuters but provides additional revenue to businesses.³⁹⁴ Financial

incentives for commuters that choose alternative forms of transportation represent an economic transfer from

employers to employees, and often substitute for other employee benefits such as free parking.³⁹⁵

Commute Trip Reductions

CASE STUDY: Trip Reduction Ordinances³⁹⁶

Some jurisdictions have ordinances that require or encourage commute trip reduction programs. Below are some examples.

Washington State's Commute Trip Reduction Law (CTR)³⁹⁷ is designed to reduce traffic congestion, pollution and fuel consumption. Employers in major urban areas with more than 100 employees at a worksite are required to develop CTR programs that encourage employees who drive alone to work to consider using an alternative commute mode such as buses, vanpools, carpools, biking, walking, telecommuting and flexible work schedules.³⁹⁸

Maricopa County, AZ³⁹⁹ requires major worksites with 50 or more employees to implement trip reduction programs.⁴⁰⁰

Cambridge, MA⁴⁰¹ has an ordinance requiring businesses to implement TDM at new developments.⁴⁰²

South Natomas, CA⁴⁰³ allows developers to use TDM programs, such as participation in a TMA, to help gain municipal acceptance of new developments.⁴⁰⁴

Bay Area, CA⁴⁰⁵ requires all public and private employers with 100 or more employees at a work site to establish

employee trip reduction targets for various locations and years, and identify various strategies to help achieve these targets.⁴⁰⁶

Pima County, AZ under the PIMA Association of Governments,⁴⁰⁷ established Travel Reduction Ordinances (TRO) to improve air quality and reduce traffic congestion by increasing alternate mode usage and reducing overall motor vehicle travel for commute trips.⁴⁰⁸

³⁹⁴ Victoria Transportation Policy Institute, www.vtpi.org/tdm/tdm26.htm, 3 October 2006.

³⁹⁵ Victoria Transportation Policy Institute, www.vtpi.org/tdm/tdm8.htm, 3 October 2006.

³⁹⁶ University of South Florida Trip Reduction Ordinances, www.nctr.usf.edu/clearinghouse/tro, 3 October 2006.

³⁹⁷ Washington State Ridesharing Organization, wsro.net/, 3 October 2006

Washington State Department of Transportation Environmental Services website, www.wsdot.wa.gov/environment/, 3 October 2006.

³⁹⁸ Contact: Mr. Keith Cotton, Commute Options Developer, (360) 705-7910, cottonk@wsdot.wa.gov.

³⁹⁹ Valley Metro Rideshare, www.valleymetro.org/Rideshare/default.asp, 3 October 2006.

⁴⁰⁰ Contact: 602.262.RIDE, rideshareinfo@ValleyMetro.org.

⁴⁰¹ Cambridge Parking and Transportation Demand Management, www.cambridgema.gov/cdd/et/tdm/index.html, 3 October 2006.

⁴⁰² Contact: Jean Clark, the City's PTDM Planning Officer, at jclark@cambridgema.gov, (617) 349-4673.

⁴⁰³ South Natomas Transportation Management Association, www.SouthNatomasTMA.org, 3 October 2006.

⁴⁰⁴ Contact: Ken Loman, Executive Director, (916) 646-0928, ken@sntma.org.

⁴⁰⁵ Bay Area Air Quality Management District, www.baagmd.gov/, 3 October 2006

Or to view the ordinance, www.arb.ca.gov/DRDB/BA/CURHTML/R13-1.HTM, 3 October 2006.

⁴⁰⁶ Contact: Juan Ortellado, Manager, Grant Programs, (415) 749-5000.

⁴⁰⁷ Pima Association of Governments Travel Reduction Program, www.pagnet.org/TRP/, 3 October 2006.

⁴⁰⁸ Pima Travel Reduction Ordinance, www.pima.gov/cob/code/c1711.html#3796, 3 October 2006.

Implement Parking Management Programs⁴⁰⁹

Managing the type and number of parking lots can reduce pavement space and vehicle use in a city. A variety of techniques allow cities to incorporate GHG

reduction into parking management systems. For example, implementing storm water management fees based on the amount of pavement on a lot, and per-space parking levies, act as incentives to property owners to reduce parking supply and implement transportation management programs.

Strategic parking management programs can also maximize parking space, and encourage alternative transport that reduce the number of parking spaces needed in a community. The next table summarizes these parking management strategies, and indicates the potential reduction in parking supply that they can typically provide.

Management Strategy	Description
Strategies That Result in More Efficient Use of Parking Facilities	
Shared Parking	Parking spaces are shared by more than one user allowing facilities to be used more efficiently.
Regulate Parking Facility Use	More convenient and visible parking spaces are managed and regulated to give priority to higher-value trips, increase efficiency and user convenience.
More Accurate and Flexible Standards	Reduce or adjust standards to more accurately reflect demand at a particular location, taking into account geographic, demographic and economic factors.
Parking Maximums	Establish maximum in addition or instead of minimum parking standards to avoid excessive parking supply.
Remote Parking	Encouraging longer-term parkers to use off-site or fringe parking facilities, so more convenient spaces are available for priority users.
Improving User Information and Marketing	Provide convenient and accurate information on parking availability and price, using maps, signs, brochures and electronic communication.
Smart Growth and Location Efficient Development	Encourage more clustered, mixed, multi-modal, infill development, which allows more shared parking and use of alternative modes.
Improved Walkability	Improve pedestrian conditions to allow parkers to conveniently access more parking facilities, increasing the functional supply in an area.
Transportation Management Associations	Transportation Management Associations are private, non-profit, member-controlled organizations that can provide a variety of services that encourage more efficient use of transport and parking resources in an area.
Increase Capacity of Existing Parking Facilities	More parking spaces can sometimes be provided by using currently wasted space, sizing spaces for smaller vehicles and motorcycles, and using car stackers.
Strategies That Reduce Parking Demand	
Transportation Demand Management Programs	Various strategies and programs can encourage more efficient travel patterns, which reduces automobile trips and parking demand.
Parking Pricing	Charge motorists directly for using parking facilities, and set fees to encourage efficient use of parking facilities.
Improve Parking Pricing Methods	Use of more convenient and effective parking pricing techniques to make parking pricing more acceptable and cost effective.
Commuter Financial Incentives	Parking cash out and transit benefits give commuters a financial incentives to shift modes and reduce parking demand.
Unbundle Parking	Rent or sell parking spaces separately from building space, so occupants pay for just the number of parking spaces that they use.
Tax Parking Facilities	Impose special taxes on parking facilities and commercial parking transactions.
Improve Enforcement and Control	Enforcement should be consistent, fair and friendly. Parking passes should have clear limitations regarding where, when and by whom they may be used, and these limitations should be enforced.
Bicycle Facilities	Supply bicycle parking, storage and changing facilities instead of some automobile parking spaces.

Table: Typical Parking Management Strategies

⁴⁰⁹ Victoria Transportation Policy Institute, www.vtpi.org/park_man.pdf, also archived at, www.natcapsolutions.org/ClimateManual/Cities/Chapter5/BestBets/TransportationResidential/park_man.pdf, 26 September 2006.

Strategies that Reduce Negative Impacts	
Develop Overflow Parking Plans	Encourage use of remote parking facilities and promote use of alternative modes during peak periods, such as busy shopping times and major events.
Address Spillover Problems	Address spillover parking problems directly with management, pricing and enforcement strategies.
Parking Facility Design and Management	Improved parking facility design to address safety, stormwater management, user comfort, security and aesthetic objectives.

Table: Typical Parking Management Strategies cont.

The table below indicates the typical reductions in parking requirements provided by various parking management strategies, and indicates those that also tend to reduce vehicle traffic.

Strategy	Parking Requirement Reductions			Reduce Vehicle Traffic
	Low	Medium	High	
Shared Parking	10%	20%	30%	
Parking Regulations	10%	20%	30%	
More Accurate Standards	10%	20%	30%	
Parking Maximums	10%	20%	30%	
Remote Parking	10%	20%	30%	
Smart Growth	10%	20%	30%	✓
Walking and Cycling Improvements	5%	10%	15%	✓
Increase Capacity of Existing Facilities	5%	10%	15%	
Mobility Management	10%	20%	30%	✓
Parking Pricing	10%	20%	30%	✓
Improve Pricing Methods	NA	NA	NA	✓
Financial Incentives	10%	20%	30%	✓
Unbundle Parking	10%	20%	30%	✓
Parking Tax Reform	5%	10%	15%	✓
Bicycle Facilities	5%	10%	15%	✓
Improve User Information	5%	10%	15%	✓
Improve Enforcement and Control	NA	NA	NA	
Transportation Management Associations	NA	NA	NA	✓
Overflow Parking Plans	NA	NA	NA	
Address Spillover Problems	NA	NA	NA	
Parking Facility Design	NA	NA	NA	

Table: Typical Reductions in Parking Requirements and Vehicle Traffic

This indicates the typical reductions in parking requirements relative to conventional practices, and whether a parking management strategy tends to reduce vehicle traffic, thereby providing additional benefits. NA indicates strategies that do not directly affect parking requirements.

How to Implement

Parking management is usually implemented by local governments or individual businesses in response to specific parking and traffic problems. Some parking management programs are coordinated by regional governments. Concerns over an immediate parking problem can instigate development of a comprehensive parking planning

process. Transportation engineers and planners, either within public agencies or hired as consultants, are usually responsible for performing parking studies, evaluating parking solutions and developing parking management plans. It is important, though, that parking management be included in a climate protection program, and not left to the traditional planners.

Below is the typical five-step process for developing a contingency-based⁴¹⁰ parking management plan:

1. Define general problems to be addressed (climate protection, parking congestion, traffic congestion, excessive parking facility costs, poor pedestrian environments, etc.) and the geographic areas to be considered.
2. Perform the following studies:
 - A parking supply inventory (how many spaces exist of each type of parking: public and private, on- and off-street, short- and long-term, free and paid, etc.) for each geographic area.
 - A parking utilization study (what portion of each type of parking is used at various time, particularly peak-periods) for each geographic area.
3. Identify potential solutions.⁴¹¹
4. Work with stakeholders to evaluate the effectiveness, benefits, costs, equity impacts, feasibility and barriers of each potential solution. Use this information to prioritize these options.
5. Develop an integrated parking plan that identifies changes in policies and practices, tasks, responsibilities, budgets, schedules, etc.

- Projections of how parking supply and demand are likely to change in the future, taking into account expected changes in land use, population, commercial activity, travel patterns, etc.
- Use this information to identify when and where parking supply is or will be inadequate or excessive.

Parking Management Benefits

Efficiency and Savings

A comprehensive parking management program that includes several strategies (shared parking,⁴¹² more accurate parking requirements, pricing, cash out,⁴¹³ etc.) can often reduce parking requirements by 30-50% compared with generous minimum parking requirements, unpriced parking, and each space assigned to an individual motorist. With appropriate parking management motorists still have adequate parking, although they may need to walk somewhat farther, and pay directly rather than indirectly for parking.

The magnitude of savings that result from parking management depends on specific conditions, including the cost per parking space and how much parking can be reduced.

Parking Management Programs

CASE STUDY: Chattanooga, TN

To encourage downtown development the Chattanooga Area Regional Transit Authority developed peripheral parking garages with free shuttle service.

⁴¹⁴ By constructing parking facilities at either end of the business district, the system intercepts commuters and visitors before they drive into the city center, reducing traffic problems. The garages' parking revenues

finance the free shuttle buses. They depart from each garage every five minutes all day, every day, and pass within walking distance of most downtown destinations. The electric-powered shuttles transport approximately one million riders each year, making shuttle-served property attractive to businesses. Since 1992, when the shuttle service began, over \$400 million

has been invested in the downtown, including a major freshwater aquarium, over 100 retail shops and 60 restaurants.

CONTACT

City of Chattanooga
Public Works Department
Traffic Engineering
(423) 757-5005

⁴¹⁰ A contingency-based strategy deals with uncertainty by identifying specific responses to possible future conditions. www.vtpi.org/tadm/tadm123.htm, 3 October 2006.

⁴¹¹ Victoria Transportation Policy Institute, www.vtpi.org/tadm/tadm72.htm, 3 October 2006.

⁴¹² Victoria Transportation Policy Institute, www.vtpi.org/tadm/tadm89.htm, 3 October 2006.

⁴¹³ Victoria Transportation Policy Institute, www.vtpi.org/tadm/tadm8.htm, 3 October 2006.

⁴¹⁴ USEPA, *Parking Spaces / Community Places: Finding the Balance Through Smart Growth Solutions*, Development, Community, and Environment Division (DCED); U.S. Environmental Protection Agency, www.epa.gov/smartgrowth/parking.htm, 2006.

Better Coverage of Public Transportation⁴¹⁵

Making public transportation more accessible is an important step for increased public transit usage. This can be done through information programs, business subsidies for employee use of mass transit; higher urban parking fees to encourage public transit; safer transit stations and stops and convenient fare structures and payment systems.

Transit encouragement programs are usually implemented by transit agencies, often with support from other government agencies and businesses. It is usually best to begin with a survey of potential users to determine what improvements and marketing strategies could increase ridership, before developing a transit plan. For example, one transportation user survey⁴¹⁶ from the greater Vancouver, Canada area found that discretionary transit riders (those that have the option of traveling by automobile):

Believe that mass transit travel can be less stressful than driving a car

Believe that mass transit travel is more convenient than driving for some trips

Believe that mass transit travel saves wear-and-tear on their car

Want transit service within convenient walking distance of their homes and destinations

Want clean transit vehicles and safe waiting areas

Want reliable, on-time service with good connections

Want fast, direct service

Stanley and Hyman (2005) identify a number of factors and strategies that tend to increase transit ridership in an area, including improved service, reduced fares, marketing, and more integrated planning and partnerships with other organizations.⁴¹⁷

A study⁴¹⁸ comparing various European regions and cities identified the following transport policies that tend to increase public transit ridership:

Availability of adequate capital funding for public transport

Relatively low public transport fares

Integration of public transport services (timed connections, new journey opportunities etc)

Restraint of parking and reallocation of road space to more sustainable modes

Integration of regional, multimodal ticketing systems

Long-term planning and implementation of these policies. To be effective, these policies must be in place for a long time (a decade or more), which implies consistent political consensus on their efficacy

Adequate regulation of bus transit systems; the most successful systems are run on a franchised (quality contract-type) basis.

Strategies include:

Fare reductions

New fare options, particularly discounted tickets and passes

Free transit areas

More convenient routing (e.g., eliminating the need for transfers)

Regularized schedules (such as having a bus every hour and half-hour)

Special route to serve particular travel requirements, such as access to employment centers

⁴¹⁵ Victoria Transportation Policy Institute, www.vtpi.org/tdm/tdm112.htm, 26 September 2006.

⁴¹⁶ TransLink, *Regional Travel Survey - Revised*, TransLink Marketing Research Department, January 2003, www.translink.bc.ca/files/polls_surveys/regtravel.pdf also archived at,

www.climatemanual.org/Cities/Chapter5/BestBets/TransportationResidential/regtravel.pdf, 30 October 2006.

⁴¹⁷ Robert G. Stanley and Robert Hyman, *Evaluation Of Recent Ridership Increases*, TCRP Research Results Digest 69, Transportation Research Board (www.trb.org), 2005.

⁴¹⁸ Colin Buchanan and Partners, *Transferability Of Best Practice In Transport Policy Delivery*, Scottish Executive July 2003, www.scotland.gov.uk/library5/development/bpntp-00.asp, 30 October 2006.

Government agencies (such as the Federal Transit Administration) and professional organizations (such as the American Transit Association) provide resources for Transit Encouragement program planning. These include:

Survey potential users and evaluate travel trends to determine what improvements and marketing strategies are likely to increase ridership.

Consider using innovative marketing techniques, price discounts and new fare collection methods (such as

“smart cards”) to attract new riders.

Identify and respond to the various market segments that they can serve, including Basic Mobility for people who are transportation disadvantaged, and fast, convenient travel for urban commuters.

Public Transportation

CASE STUDY: Boulder, CO

Starting in 1989, the city of Boulder, Colorado began implementing a demonstration transit service using a fleet of small, colorfully designed buses to provide high frequency, inexpensive and direct service within the city. And thus, the first Community Transit Network bus, the HOP, was born. Today, there are six bus routes in the Community Transit Network—HOP, SKIP, JUMP, BOUND, DASH and STAMPEDE. All have a unique identity and amenities shaped with community input and direction. In 1990, Transit ridership was about 5,000 riders daily for all local and regional routes in and out of Boulder. In 2002, ridership was at a daily average of about 26,000, a 500% increase. The city of Boulder partnered with the city of Longmont and Boulder County to add another high-frequency bus route called the BOLT on a local highway in 2004.⁴¹⁹

Benefits beyond GHG emission reductions of the Community Transit Network:

Provides a convenient transit

alternative to the single occupancy vehicle.

Uses neighborhood-scaled vehicles to fit the context of Boulder.

Strengthens the local economy by providing easy access around Boulder and to and from surrounding communities.

Provides wheelchair accessible transportation.

Reduces air pollution by using clean-burning fuels.

Alleviates traffic congestion.

Minimizes the need for roadway expansion and provides reliable, high frequency service.

Operates clean, comfortable, human-scaled vehicles, with special amenities such as music.

Promotes a positive transit image with attractive vehicles and on-going marketing support.

Accepts Eco Passes (transit passes for students and residents of certain neighborhoods).

Includes bike racks, holding two bikes at one time, that allow for integration of travel.

In November 2000, residents of the Forest Glen neighborhood in the city of Boulder voted to form a General Improvement District (GID) to provide Eco Pass transit passes for all neighborhood residents including home owners and renters. These passes are paid for by residents in the Forest Glen as part of their annual property tax. The pass allows unlimited riding on all RTD buses, Light Rail service to Denver International Airport, downtown Denver and Eldora Mountain Resort.

CONTACT

City of Boulder
Transportation Advisory Board
(303) 441-3266
Publicworks@bouldercolorado.gov

⁴¹⁹ City of Boulder Transportation website, www.ci.boulder.co.us/index.php?option=com_content&task=view&id=707&Itemid=1206, 26 September 2006.

Car Sharing Programs and Installation of Park and Ride Facilities⁴²⁰

Rideshare

Rideshare programs typically provide carpool matching, vanpool sponsorship, marketing programs, and incentives to reduce driving. Rideshare incentives may include giving High Occupant Vehicles (HOV) priority⁴²¹ (e.g., HOV highway lanes), preferential parking spaces, and awards. Some employers offer commuter financial incentives⁴²² such as a cash payment to employees who carpool, or a voucher that covers vanpool fees, provided as an alternative to a free parking space. Because they have

significant economies of scale (the more people who register, the more effective they are at successfully matching riders), it is helpful if one well-publicized ride-matching program serves an entire geographic region.

Rideshare programs that include incentives such as HOV priority often reduce commute trips by 10-30%⁴²³. If implemented without such incentives travel impacts are usually smaller. Evans and Pratt (2005) describe several worksites where 5-20% of employees commute by vanpool. The most effective programs tend to have paid parking, subsidies for alternative modes and other incentives to encourage reduced automobile commuting.

Ridesharing can reduce peak-period vehicle trips and increase commuter's travel choices. It

reduces congestion, road and parking facility costs, crash risk and pollution emissions. Ridesharing tends to have the lowest cost per passenger-mile of any motorized mode of transportation, since it makes use of a vehicle seat that would otherwise be empty. Ridesharing provides consumer financial savings (as estimated in the table below), and time savings if there are HOV priority facilities. Crash risk declines due to fewer vehicles on the road.⁴²⁴ Rideshare programs improve transportation options and are particularly helpful to commuters who cannot drive or lack a reliable automobile.⁴²⁵

Organizations such as the Association for Commuter Transportation and Commuter Connections can provide advice and resources for developing an

Round Trip Miles	Drive Alone	3-Rider Car Pool	10-Rider Van Pool
30	\$193	\$64	\$31
40	\$257	\$86	\$37
50	\$321	\$107	\$43
60	\$386	\$129	\$50
70	\$450	\$150	\$56
80	\$514	\$171	\$63

Table: Estimated Monthly Commuting Costs

⁴²⁰ Victoria Transportation Policy Institute Ridesharing, www.vtppi.org/tadm/tadm34.htm, 30 October 2006.

⁴²¹ Victoria Transportation Policy Institute, www.vtppi.org/tadm/tadm19.htm, 3 October 2006.

⁴²² Victoria Transportation Policy Institute, www.vtppi.org/tadm/tadm8.htm, 3 October 2006.

⁴²³ Philip Winters and Daniel Rudge, *Commute Alternatives Educational Outreach*, National Urban Transit Institute, Center for Urban Transportation Research, USF (Tampa; www.cutr.eng.usf.edu), 1995.

⁴²⁴ Victoria Transportation Policy Institute, www.vtppi.org/tadm/tadm58.htm, 3 October 2006.

⁴²⁵ The *SMART Trip Reduction Manual* published by Pollution Probe (2001) provides information on calculating the benefits of ridesharing programs to employers and employees. (www.pollutionprobe.org/Publications/Air.htm), 2001, 26 October 2006.

effective ridesharing program. A study in the Seattle area identified several ways of improving and increasing vanpooling.⁴²⁶

Ride share best practices:
Should be implemented as part of a comprehensive TDM Program.

Should include ridematching services, HOV priority, and other trip reduction strategies.

Ridematching services should cover a large geographic area (such as an entire region) in order to create the largest possible pool of users.

Transportation agencies, businesses and employees should all be involved in planning Rideshare Programs.

Provide incentives to attract and retain rideshare users, such as mileage-points and vehicle insurance discounts.

Car Sharing & Park and Ride Programs

CASE STUDY: King County, WA

RideShare Online,⁴²⁷ launched in 2001, was the first self-serve, regional public Internet ridematching service in the nation. RideshareOnline instantly matches commuters with carpool or vanpool partners with a similar daily commute in nine Puget Sound area counties, including King, Pierce, Snohomish, Kitsap, Thurston, Island, Mason, Skagit and Whatcom counties.

"This new service puts the power into the hands of commuters," said King County Executive Ron Sims. "Instead of sending in

applications and information and waiting for a reply, you can go online anytime day or night to find names in our database of 9,000 registered commuters, e-mail them directly yourself, and within minutes you could be hearing back from a potential rideshare partner."⁴²⁸

Online registration is simple. After typing in their e-mail address and choosing a password, users enter their work location and the starting point of their commute -- either a home address or a nearby intersection.

To preserve privacy, home addresses are not displayed publicly. They enter their weekly work schedule and any daily variations. By return e-mail they receive a confirmation code to complete their registration. They can instantly see a list of rideshare matches to whom they may e-mail a rideshare request.

CONTACT

Ridematch Coordinator
Cathy Blumenthal
(206) 263-4445
cathy.blumenthal@metrokc.gov

Park and Ride

Park & Ride⁴²⁹ facilities are usually implemented by regional transportation or transit agencies. In some cases, existing, underutilized parking (such as a mall parking lot) is designated for Park & Ride use. Patrols and

lighting are sometimes provided to address security concerns that users may have about leaving their vehicles.

Benefits and Costs

By encouraging shifts to transit and ridesharing, Park & Ride facilities reduce urban highway

traffic congestion and worksite parking demand. These benefits can be significant since Park & Ride tends to be most effective where traffic congestion and parking problems are worst. However, automobile Park & Ride only provides modest reductions in local road traffic,

⁴²⁶ Bryon York and David Fabricatore (2Plus), *Puget Sound Vanpool Market Assessment*, Office of Urban Mobility, WSDOT (www.wsdot.wa.gov/Mobility/TDM/vanpoolmarket.htm), 2001.

⁴²⁷ Rideshare Online, www.RideshareOnline.com, 3 October 2006.

⁴²⁸ King County Department of Transportation, www.metrokc.gov/kcdot/news/picturearch/pw010319_ridematch.htm, 3 October 2006.

⁴²⁹ Victoria Transportation Policy Institute, www.vtppi.org/tm/tm27.htm, 26 September 2006.

pollution, energy use and consumer costs, since a local automobile trip is still made. Bicycle Park & Ride can provide greater economic and environmental benefits.

Shopping centers adjacent to Park & Ride facilities tend to benefit from additional shopping by the commuters who park there.⁴³⁰

Costs are primarily associated with facility construction and operation. Construction costs typically average several

thousand dollars per space, which is usually lower than the costs of providing parking at city centers due to lower land values.

Best Practices for Park & Ride facilities:

Facilities should be developed as part of an overall transit and rideshare improvement program.

Facilities should be located within view of businesses or homes, for the sake of security.

Facilities should include bike storage lockers, or other secure bike storage if demand exists.

Facilities should have adequate lighting, landscaping and other amenities (bus shelters, garbage cans, etc.).

It is usually best to have several smaller Park & Ride facilities in different locations, rather than one large one.

Car Sharing & Park and Ride Programs

CASE STUDY: Space Coast Area Transit, Florida

The Space Coast Area Transit system⁴³¹ was established in 1974 and has been a leader in motor transportation ever since. In 2003, SCAT was awarded the prestigious Outstanding Public Transportation System Award by the American Public Transportation Association. One of SCAT's most successful programs has been SCAT Park-

and-Ride, which the agency promotes as part of its Commuter Assistance program. It identifies the following benefits to employers of using Park & Ride:

1. Reduced on-site parking
2. Employer/Employee tax credits
3. Improved Employee Recruitment and Retention

4. Improved Customer Service and Employee Morale
5. Improved Corporate Image
6. Bottom-Line, Profitability Goes Up

CONTACT

(321) 633-1878

Location Efficient Mortgages⁴³²

Location efficient mortgages give borrowers lower rates if they live near to public transit. The rationale is that the lower costs will make the borrower better able to meet mortgage payments, thus reducing risk. Location Efficient Mortgages

(LEMs) are implemented by residential mortgage lenders, often with the support and encouragement of government agencies such as Fannie Mae and the Canadian Mortgage and Housing Corporation. Lenders use a model to determine which locations have lower transportation costs, and therefore can qualify for higher mortgage payments. The

following factors can be considered in such developments:

Proximity to high quality transit (such as a rail transit station, or a bus line with frequent service)

Walking and cycling conditions

⁴³⁰ Francis Wambalaba and Julie Goodwill, *Evaluation of Shared Use Park & Ride Impact on Properties*, National Center for Transit Research, University of South Florida (www.nctr.usf.edu), April 2004, 26 October 2006.

⁴³¹ Space Coast Area Transit, www.ridescat.com/aboutscat/history.php, 3 October 2006.

⁴³² Victoria Transportation Policy Institute, www.vtqi.org/tdm/tdm22.htm, 3 October 2006.

Number of public services within convenient walking distance (schools, shops, parks, medical services, pharmacy, etc.)

Carshare services within convenient walking distance

Options for residents who do not own an automobile to not pay for parking

Location efficient developments are designed and located to improve overall accessibility and affordability of residential and commercial real estate. They are often implemented as part of “Smart Growth”⁴³³ and “New Urbanist”⁴³⁴ planning.⁴³⁵ The following criteria can be used to

evaluate whether a development qualifies for a location efficient mortgage:

Is it located in an urban area within a half-mile of quality public transit?

Does it include, or is it located near, commonly-used public services such as grocery stores, video stores and public schools?

Will it reduce dependency on automobiles?

Does it have a minimum density of 20 units per acre?

Does it have at least 20 units?

Is it reflect good design features?

Is it being developed with substantial community input?

Does it include a significant portion of affordable housing units?

Travel Impacts

Per capita automobile travel is often 20-50% lower in location efficient developments than in automobile-dependent, urban fringe locations. Table 1 summarizes the projected vehicle miles traveled (VMT) reduction impacts of various location-efficient, infill developments.

Location	Description	VMT Reduction
Atlanta	138-acre brownfield, mixed-use project	15-52%
Baltimore	400 housing units and 800 jobs on waterfront infill project	55%
Dallas	400 housing units and 1,500 jobs located 0.1 miles from Dallas Area Rapid Transit (DART) station	38%
Montgomery County	Infill site near major transit center	42%
San Diego	Infill development project	52%
West Palm Beach	Auto-dependent infill project	39%

Table: Infill VMT Reductions⁴³⁶

Location efficient developments and mortgages can provide several benefits:

Consumers benefit from more housing, transportation choices and financial savings. Non-drivers, in particular, benefit from having housing options designed for maximum accessibility, and financial savings from reduced parking costs.

Developers can benefit from having more design flexibility, including more opportunities for infill development, reduced parking costs, and because LEMs increase the amount a household can spend on housing. It creates new markets and financing options.

Urban neighborhoods can benefit from more opportunities for middle-class

infill development, fewer motor vehicles and less vehicle traffic.

By reducing per capita vehicle ownership use, Location Efficient Development can reduce regional traffic congestion, road and parking facility costs, traffic crashes, pollution and sprawl.

Regional economies tend to benefit when consumers shift

⁴³³ Victoria Transportation Policy Institute, www.vtpi.org/tm/tm38.htm, 3 October 2006.

⁴³⁴ Victoria Transportation Policy Institute, www.vtpi.org/tm/tm24.htm, 3 October 2006.

⁴³⁵ Danielle Arigoni, *Affordable Housing and Smart Growth: Making the Connections*, Subgroup on Affordable Housing, Smart Growth Network (www.smartgrowth.org) and National Neighborhood Coalition (www.neighborhoodcoalition.org), 2001.

⁴³⁶ CCAP, *State and Local Leadership On Transportation And Climate Change*, Center for Clean Air Policy (www.ccap.org), 2003, 26 October 2006.

their transportation expenditures from vehicles and fuel to transit services or general consumer goods.

Here are some specific recommendations for implementing Location Efficient Developments and Mortgages⁴³⁷:

A location efficient development should include a variety of land use and

transportation features that improve access and mobility options, including pedestrian and cycling improvements, transit improvements, and mixed land use.

It should also include a range of housing types and prices, so that people in various lifecycle stages and income classes can choose such housing.

Parking requirements should be reduced or eliminated for location efficient housing. Rather than including parking with housing, parking should be rented separately, so households only pay for the amount of parking they actually use.

Parking should be managed to avoid spillover problems.

Location Efficient Mortgages

CASE STUDY: Denver, CO

Denver Initiative to Boost Affordable Housing Near Transit Stations⁴³⁸

The Colorado Housing and Finance Authority⁴³⁹ and seven metro Denver cities will collaborate on the sale of \$53 million private activity bonds (tax-exempt bonds issued by the government for the purpose of providing special [financing benefits](#) for qualified projects) to support development of low- and moderate-income rental housing near RTD transit stations along the six-line - a 150-mile rail network to be developed during the next 12 years. At least 51 of the 57 rapid-transit stations that will be built lend themselves to mixed-use development that should include affordable housing.

Affordable housing that will be eligible for assistance from the authority and the seven cities must be within 1,500 feet of a planned or existing transit station. Each project must include 50 or more dwelling units.

At least 75% of the rental units must be for individuals or families whose income is at or below the area's median income, adjusted for family size. Other provisions ensure some housing is reserved for low-income residents. Developers who participate in the transit-oriented affordable-housing program also may be eligible for low-income-housing tax credits that can generate equity for the projects.

Calling this FasTracks program⁴⁴⁰ "the single most ambitious

integrated transit solution in the history of the United States," Denver Mayor John Hickenlooper said it will lead to the formation of "small villages" around transit stations where people can live, work and shop without being overly dependent on automobiles.

CONTACT

Robert M. Munroe
Colorado Housing and Finance Authority
(303) 297-7337
bobm@colohfa.org

Principal of Civic Results
John Parr
Metro Mayors Caucus
(303) 477-9985
john@civicresults.org

⁴³⁷ Danielle Arigoni, *Affordable Housing and Smart Growth: Making the Connections*, Subgroup on Affordable Housing, Smart Growth Network (www.smartgrowth.org) and National Neighborhood Coalition (www.neighborhoodcoalition.org), 2001.

⁴³⁸ Metro Mayor Caucus, www.metro-mayors.org/Housing.html, 3 October 2006.

⁴³⁹ Colorado Housing and Finance, www.colohfa.org/, 3 October 2006.

⁴⁴⁰ Denver FasTracks Plans, www.rtd-denver.com/fastracks/index.html, 3 October 2006.

Provide Incentives for Hybrid and Low Emission Vehicle Use

While the ideal (from a climate perspective) is that citizens have access to alternative

transportation options to deter automobile ownership, many citizens, especially those living outside dense urban areas, still need or want to purchase their own automobiles. Municipalities can create incentives to encourage citizens to purchase vehicles that produce less GHG

emissions. For example, cities such as Salt Lake City, Aspen, Baltimore, Los Angeles, Albuquerque, Hartford and New Haven already have various forms of free or discounted parking for hybrid or high efficiency drivers.^{441 442}

Incentives for Hybrid and Low Emission Vehicle Use

CASE STUDY: Ferndale, MI

Since May 2006, drivers of fuel-efficient vehicles in a suburb outside of the Motor City are saving money on more than fuel. The city of Ferndale recently passed a local ordinance, the first of its kind in Michigan, that enables drivers of cars that get 30-miles-a-gallon or better, to park for free at the city's parking meters.⁴⁴³ In order to pay for the

administrative costs of the program, car owners must register their vehicle and pay \$8 to get a permit for the free meter parking. Craig Covey, the Ferndale council member who proposed the ordinance, explained the city's decision, "We're all hurting with the high gas prices and this is a small,

symbolic step to send a message: We care about progress."⁴⁴⁴

CONTACT

City of Ferndale, Michigan
300 East Nine Mile Road
Ferndale, Michigan 48220
(248) 546-2360

⁴⁴¹ "Save on fuel, and park free, too. Councilor suggests hybrid owner perk" Boston Globe, Nov 2005, www.boston.com/news/local/articles/2005/11/03/save_on_fuel_and_park_free_too/, 15 October 2006.

⁴⁴² City of Hartford, Connecticut (www.hartford.gov/news/PR71405parking.pdf). Vehicle owners who can demonstrate that they drive a vehicle that gets at least 30 miles per gallon - both city and highway-qualify for a 50% discount for monthly parking patrons at three Downtown Hartford parking garages, www.newenglandfutures.org/issues/energy/bestpractices/, 3 October 2006.

⁴⁴³ "Drive a hybrid? You don't have to feed the meter in Ferndale" Detroit Free Press, April 2006, www.freep.com/apps/pbcs.dll/article?AID=/20060829/NEWS99/60829020, 3 October 2006.

⁴⁴⁴ Ibid.

Additional Resources

Road Tax Discount for Car-Free Households. The City of Austin, Texas has an innovative way of financing transportation infrastructure that rewards households that reduce their vehicle ownership. City utility bills include a “Transportation User Fee” that averages \$30 to \$40 annually for a typical household. This charge is based on the average number of daily motor vehicle trips made per property, reflecting its size and use. The city provides exemptions to residential properties with occupants that do not own or regularly use a private motor vehicle for transportation, or if they are 65 years of age or older.⁴⁴⁵

Commuter Choice is a nationwide partnership designed to help employers create customized solutions to their employees' commuting challenges. Commuter Choice can also include communities working with residents, schools working with students, and even developers working with future tenants to provide and promote choices for travelers.
www.commuterchoice.com/index.php?page=employers

Ride Arrangers, Denver Regional Council of Governments
RideArrangers helps businesses and individuals ease traffic congestion and reduce pollution by promoting use of alternative transportation. Using the latest transportation management ideas to keep traffic moving, RideArrangers maintains air quality and preserves the quality of life that Denver metro area residents know and expect.
www.drcog.org/index.cfm?page=RideArrangers

Stormwater Management Fees to reduce parking supply and instigate transportation management programs. The City of Bellingham charges stormwater fees of \$3 a month for smaller buildings with 300 to 1,000 square feet of impervious surfaces and \$5 per 3,000 square feet for larger buildings. This indicates annualized costs 2 to 5.5 cents per square foot of impervious surface.
(www.vtapi.org/tca/tca0515.pdf)

Travel Matters
Includes an interactive emissions calculator, on-line emissions maps and a learning/resource center.
www.travelmatters.org



NATURAL CAPITALISM SOLUTIONS

NATURAL CAPITALISM SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548

⁴⁴⁵ See www.vtapi.org/tdm/tdm119.htm and www.ci.austin.tx.us, 30 September 2006.

Chapter 5: Develop a Local Action Plan Long Term Initiatives Sustainable Urban Planning

DOCUMENT CONTENTS

Denser Communities.....	145
CASE STUDIES:	
Eugene, OR.....	145
Saint Paul, MN.....	147
Glenwood Park, Atlanta, GA	
.....	148
Civano, AZ.....	149
Additional Resources	151

*In the Ecology of Cities,*⁴⁴⁶ Lester R. Brown states that, “By 2007 more than half of us will live in cities—making us, for the first time, an urban species.” This means that urban planning decisions made now will have an enormous effect for a long time to come. The field of urban planning connects many topics discussed in this guide, such as, energy infrastructure; environmental and land management; construction and architecture; transportation infrastructure and much more.

The field of sustainable city planning is a rapidly growing one, with entire organizations dedicated to it, books written about it, conferences held and professional associations forming (a Google search returns over 11 million hits). It is impossible here to describe the extent to which this global movement intersects with community efforts to implement

*carbon protection programs,*⁴⁴⁷ but it is important that efforts to reduce greenhouse gas emissions be conducted with an eye to the impacts they will have on the whole system of the city.⁴⁴⁸

Sustainable urban development includes planning that promotes mixed-use development (residential and commercial use in the same area), transportation alternatives, walkable/denser communities, compact building design, open/ green space and attractive/ distinctive communities. Such approaches can enable a community to fight climate change (and improve local quality of life) by reducing personal automobile dependence (See Chapter 5, Residential Transportation Section), increasing green space (See Chapter 5, Reducing the Impact of Continued Emissions Section) and providing incentives for green building (see Chapter 5, Buildings Section).

⁴⁴⁶ Earth Policy Institute, *Ecology of Cities*, www.earth-policy.org/Books/Seg/PB2ch11_ss2.htm, 15 October 2006.

⁴⁴⁷ An enormous amount of work on this topic is being done in Europe. The Scandinavians, in particular are leaders in this field. See www.emagazine.com/view/?2842, the European Commission adopted the Thematic Strategy on the Urban Environment on 11. January 2006, ec.europa.eu/environment/urban/home_en.htm. The Ministry for the environment in New Zealand also has some excellent material, www.mfe.govt.nz/issues/urban/sustainable-cities/, 5 December 2006.

Denser Communities

Several studies have linked denser communities with reduced driving and, in turn, reduced greenhouse gas (GHG) emissions. High-density urban areas utilizing mixed-use development make human powered and public transportation more practical,

while decreasing emissions and encouraging exercise. For example, the book *Sustainability and Cities: Overcoming Automobile Dependence* describes the strong correlation between urban density and driving related consumption. Cities considered to have low-density development (fewer than 50 persons per hectare) were found to have fossil fuel consumption rates triple that of

more densely developed cities. A study by Natural Resources Defense Council⁴⁴⁹ notes a similarly strong correlation between density and miles driven in San Francisco, Los Angeles and Chicago. The following graph from the study demonstrates how people living in denser areas in these three cities are traveling fewer miles per year.

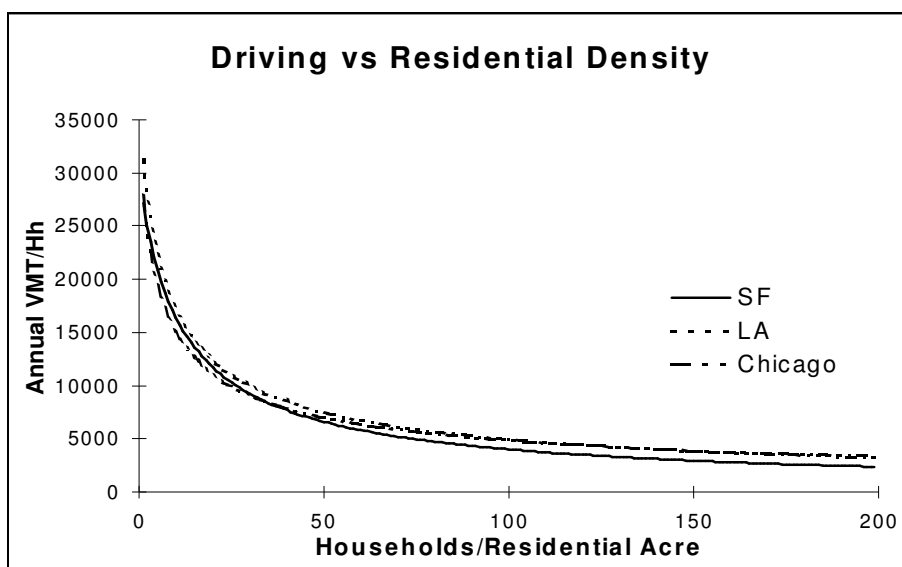


Table: Driving vs. Residential Density

The following case studies illustrate policies that different

communities have taken to begin, enhance and reach their sustainable planning goals.

Sustainable Urban Planning

CASE STUDY: Eugene, OR

"Each year, the Green Guide recognizes cities across the country that are providing the healthiest, most environmentally-conscious, energy efficient and

least-polluting places in which to live."⁴⁵⁰ The Green Guide is an internationally recognized source for news and consumer information about environmental

living. In 2006, the Green Guide named Eugene, Oregon the #1 Green City in America.⁴⁵¹

⁴⁴⁸ The UN Habitat Sustainable Cities Program, www.unhabitat.org/categories.asp?catid=369, 5 December 2006.

⁴⁴⁹ National Resources Defense Council, www.arb.ca.gov/ch/presentations/nrdc.pdf, 15 October 2006.

⁴⁵⁰ Eugene website: www.eugene-or.gov/portal/server.pt, 15 October 2006.

⁴⁵¹ The Green Guide Top 10 Green Cities in 2006 www.thegreenguide.com/docprint.mhtml?i=113&s=top10cities, 15 October 2006.

Political Action and Policies:⁴⁵²

The city staff began a new community-wide pedestrian and bicycle strategic planning process in 2006. The program includes public education and input activities to help direct the planning process. The goal of the planning effort is to increase the use of non-motorized transportation in Eugene.

Mixed Use Development:⁴⁵³

In 2001, the concept of mixed-use development became the official growth management policy for the city of Eugene.

The city has identified dozens of potential "centers" that can eventually be developed to have greater density, yet become desirable, pedestrian-friendly, neighborhoods, featuring shops, residences, green space and quality transportation options. "When combined with improved transit, such centers will reduce reliance on automobile travel, offset the need for costly street improvements, slow sprawl onto nearby agricultural and forest lands and provide a greater variety of housing types inside the Urban Growth Boundary."⁴⁵⁴

To ease the financial burden of this process, the city has applied for grants from the State of Oregon

Transportation Growth Management (TGM) program every two years since 1997. "These grants funded a demonstration of transportation-efficient land use planning focusing on the preparation and adoption of a concept design, strategies and ordinances for several potential mixed-use development sites."⁴⁵⁵

Transportation:⁴⁵⁶

By 2006, Eugene had developed 30 miles of off-street paths, 89 miles of on-street bicycle lanes and 5 bicycle/pedestrian bridges spanning the Willamette River.

Eugene holds an annual Walking and Biking Summit, providing input on ways to make the city a more "walkable and bikable" city.

Open/Green Space:⁴⁵⁷

Eugene has preserved over 16% of its land as green space, including athletic fields, city parks, public gardens, trails and waterfront.

The city has over 2,500 acres of publicly owned wetlands, and its West Eugene Wetlands Program has been nationally recognized as a model for resource protection and enhancement.⁴⁵⁸

Eugene offers 120 public parks, 45 playgrounds, 6 community gardens, 60 miles of trails and over 3,000 acres of natural areas.

Construction Techniques/Energy Efficiency:

In July 2006, the City Council unanimously adopted the city of Eugene's first formal "green building" policy, requiring city-owned and occupied buildings to be constructed and maintained in environmentally and economically sustainable ways.

Examples of the new policy include two new fire stations that incorporate day-lighting, solar hot water, highly reflective roofing, high efficiency heating and cooling systems, preference for local and renewable materials, low emission paints and laminates and 90% recycling of construction waste.

⁴⁵² Sustainable Eugene: www.eugene-or.gov/portal/server.pt?space=Opener&control=OpenObject&cached=true&parentname=CommunityPage&parentid=0&in_hi_ClassID=514&in_hi_userid=2&in_hi_ObjectID=1553&in_hi_OpenerMode=2&in_hi_userid=2&control=SetCommunity&CommunityID=334&PageID=0, 15 October 2006.

⁴⁵³ Mixed-use Development: www.eugene-or.gov/portal/server.pt?space=CommunityPage&cached=true&parentname=CommunityPage&parentid=5&in_hi_userid=2&control=SetCommunity&CommunityID=334&PageID=0, 15 October 2006.

⁴⁵⁴ The Green Guide, www.greenguide.com, 15 October 2006.

⁴⁵⁵ Eugene website, www.Eugene-or.gov, 15 October 2006.

⁴⁵⁶ Eugene Transportation: www.eugene-or.gov/portal/server.pt?space=CommunityPage&cached=true&parentname=CommunityPage&parentid=2&in_hi_userid=2&control=SetCommunity&CommunityID=435&PageID=0, 15 October 2006.

⁴⁵⁷ Parks and Open Space Planning: www.eugene-or.gov/portal/server.pt?space=CommunityPage&cached=true&parentname=CommunityPage&parentid=2&in_hi_userid=2&control=SetCommunity&CommunityID=668&PageID=0, 18 October 2006.

⁴⁵⁸ Greener Buildings, www.greenerbuildings.com, 15 October 2006.

CONTACT

Facilities Division Manager
Glen Svendsen
Eugene's sustainable building
policies
(541) 682-5008
glen.l.svendsen@ci.eugene.or.us

Senior Planner
Allen Lowe
Eugene's planning division
(541) 682-5113

Parks and Open Space Manager
Carolyn Weiss
Eugene's Parks and Open Space
Planning
(541) 682-4800

Sustainable Urban Planning

CASE STUDY: Saint Paul, MN⁴⁵⁹

Under the Urban CO₂ Reduction Project, St. Paul has already surpassed its 1997 goals for CO₂ emissions reduction and is currently planning to reach a 20% reduction of 1988 CO₂ levels by 2020. The plan includes a wide variety of activities including:

Open/Green Space:

In addition to providing great options for alternative and public transportation, St. Paul also offers commuters and pedestrians pollution-free transportation and recreation via an extensive trail system.

The city operates 101 parks, maintains 101 miles of paved

off-street trails, 24 miles of dirt trails and 160 garden sites.

The city promotes “green roofs,” which reduce heating and cooling costs and reduce storm water runoff.

Construction Techniques/Energy Efficiency:

The city requires every developer that uses public dollars to meet with energy design consultants to make buildings more energy-efficient and cost-effective.⁴⁶⁰

St. Paul also supports energy-efficient households by assisting residents to install renewable energy. The Minnesota State Department of city's grid.

Commerce even encourages businesses and residents to hook up solar systems to the

CONTACT

The general number for the city of St. Paul government
(651) 266-8989

Planning and Development
(651) 266-6700

Parks and Recreation
(651) 266-6400

District Energy
(651) 297-8955

St. Paul Neighborhood Energy Consortium
(651) 221-4462

⁴⁵⁹ Unless otherwise cited information on sustainable programs in the city of St. Paul can be found on the “Sustainable St. Paul: Initiatives and Programs” page of the city's website. This page includes links to transit and transportation; planning and development; natural resources and parks and recreation; energy conservation; and clean air: stpaul.gov/initiatives/sustainable/programs/initiatives.html, 15 October 2006.

⁴⁶⁰ Greener Buildings, www.greenerbuildings.com, 15 October 2006.

CASE STUDY: Glenwood Park, Atlanta, GA⁴⁶¹

Glenwood Park has utilized “infill” planning⁴⁶² on a former industrial site, two miles from downtown Atlanta. The 28-acre brownfield⁴⁶³ redevelopment offers 350 residences in a mix of condominiums, townhouses, houses and 70,000 square feet of retail and office space.

Mixed Use Development:

Rezoned for mixed use the site was designed with narrower streets and tighter corners for qualifying “traditional neighborhood developments.” This type of zoning is crucial to making Glenwood Park a pedestrian friendly, healthier and environmentally sound neighborhood.

By mixing useful retail, shops and restaurants with residences, the development has brought vitality to the streets, provided residents with walkable destinations, reducing the number of local daily driving trips. “By one estimate, Glenwood Park will save 1.6 million miles of driving per year over what residents would have driven if they instead lived in a “typical” new Atlanta development.”⁴⁶⁴

Transportation:

Glenwood Park offers residents many public transportation and commuting options. The development is: One mile from two different Metropolitan Atlanta Rapid Transit Authority rail stops and Directly on an active bus route that leads to downtown.

On the proposed route for a trail and transit line that will loop around in-town Atlanta using old rail lines.

Open/Green Space:

The neighborhood contains three parks of varying sizes and atmosphere. The largest of the three acts as an area for community gathering and recreation. The second is a classic urban square in the heart of the commercial area. The third and smallest acts as a more intimate meeting area, featuring views of the Atlanta skyline and access to the largest park.

Construction Techniques/Energy Efficiency:

All homes and condos built in Glenwood Park meet Atlanta’s

EarthCraft House program standards. EarthCraft House is a voluntary green building program of the Greater Atlanta Home Builders Association, which helps educate consumers on the economic and health benefits of “green” building techniques, provides rigorous testing and inspection of homes and offers access to discounted energy mortgage programs.

CONTACT

Green Street Properties, LLC - the developers
(404) 879- 2230

Dover, Kohl & Partners—Planning Firm
(305) 666-0446
www.doverkohl.com

Tunnell-Spangler-Walsh & Associates—Planning Firm
(404) 873-6730
www.tunspan.com/

EarthCraft Homes, a division of Southface Energy Institute
(404) 817-3549
www.southface.org/web/earthcraft_house/earthcraft_overview.htm

Greater Atlanta Home Builders Association:
(770) 938-9900

⁴⁶¹ For more information on Glenwood Park visit:

Terrain.org Unsprawl Case Study, www.terrain.org/unsprawl/17/, 15 October 2006.

⁴⁶² Glenwood Park homepage: www.glenwoodpark.com/glenwood/default.aspx, 15 October 2006.

⁴⁶³ Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. More Information on Brownfields: EPA Brownfields Cleanup and Redevelopment, www.epa.gov/brownfields/, 18 October 2006.

⁴⁶⁴ Terrain.org Unsprawl Case Study, www.terrain.org/unsprawl/17/, 15 October 2006.

CASE STUDY: Civano, AZ

In 1998 President Bill Clinton named Civano Arizona one of five national pilot developments under the Partnership for Advancing Technology in Housing (PATH). These PATH pilots, selected for their highly innovative technologies, as well as for new approaches for land planning and design, were created to be models for the U.S. residential construction industry.⁴⁶⁵

Located in Southeast Tucson, Civano encompasses 1,145 acres. The community is planned to comprise 4 neighborhoods housing over 2,600 families, and 110 acres of commercial, industrial and retail uses. Its planners refer to it as, "an antidote to urban sprawl's five banes: loss of community, loss of open space, traffic congestion, air pollution and poor use of resources."⁴⁶⁶

Political Action/Policies:

Civano has adopted three tenets to guide its land use and overall physical, social and economic development:
(1) Create a sense of place that fosters community and connects people to one another and their natural environments, (2) tread lighter on the land through innovative design, (3) introduce sustainable construction

materials and new technologies to advance the quality of life.

Mixed Use Development:

Developers of Civano designed the neighborhoods to be pedestrian friendly, attracting foot traffic by mixing uses and activities, such as corporate offices, a café, art gallery, retail stores and a meeting hall together in the town center.

Transportation:

Developers plan to reduce automobile pollution by 40%. To reach this goal homes are designed to be within walking distance of neighborhood centers, and developers are striving to create one job onsite for every two residences.

Open/Green Space:

35% of the land is set aside specifically for natural or enhanced open space.

Community orchards, linear parks, pedestrian trails, bike paths, environmentally-friendly recreational facilities and preserved desert wild lands are all integral to the community's design.

Civano Nursery's salvage program has been replanting approximately 65% of the major trees moved during construction with a 97% success rate. The program has so far saved over 2,400 plants and nearly 500 mature trees.

Construction Techniques/Energy Efficiency:

Civano's building plan requires adherence to a strict energy and building code that will result in enough energy savings to prevent 1 billion pounds of carbon emissions over the next two decades.

Homes in Civano are being designed using passive solar siting and active solar energy through photovoltaic panels and/or hot water systems on the roofs.

Buildings employ the use of super-efficient windows, "cool tower" water cooling and thermal mass of walls to help regulate indoor temperatures while relying less on heating and cooling systems.

Developers are using these resource efficient building techniques to reach their goal of a reduction in home energy consumption by 50% over 1995 levels.

⁴⁶⁵ The Partnership for Advancing Technology in Housing (PATH) article, April 1999, www.pathnet.org/sp.asp?id=1628, 15 October 2006.

⁴⁶⁶ Terrain.org Unsprawl Case Study, www.terrain.org/unsprawl/5/, 15 October 2006.

Water harvesting, in which water from the structure's roof is collected and stored in underground cisterns for cooling will help designers meet their goal of reducing the community's potable water consumption by 65%.⁴⁶⁷ The community will feature xeriscaping.

Developed by Civano Development Company, city of Tucson, Fannie Mae American Communities Fund, Arizona Department of Commerce Energy Office, Congress for New Urbanism and other partners.

CONTACT

Fannie Mae
Colleen Haggerty
(626) 396-5225

Civano Development Company
Lynn Hudson
(520) 889-8888

City of Tucson, Department of
Architecture and Engineering
(520) 791-3101

Congress for New Urbanism, a
Chicago based non-profit that
works with planners, developers,
builders and architects to teach
them how to implement the
principles of New Urbanism.
(312) 551-7300
cnuinfo@cnu.org.

⁴⁶⁷ For more information on the Community of Civano, visit:
City of Tucson Featured Project www.tucsonaz.gov/lv-goal11.html, 15 October 2006.

Additional Resources

LASER: Local Action for sustainable Economic Development. This free manual guides a community in sustainable economic development.
www.global-laser.org

The Key to Sustainable Cities: Meeting Human Needs, Transforming Community Systems by Gwendolyn Hallsmith. Nov 30, 2006 – Written to help cities implement Agenda 21, the UN's approach to sustainable development, this manual is the predecessor to LASER. Both are linked to a massive data base of solutions for cities

Sustainable Cities, Best Practices for Renewable Energy and Energy Efficiency. Ken Regelson, 2005. This report documents innovative and successful programs U.S. cities are using to become more sustainable
rmc.sierraclub.org/energy/library/sustainablecities.pdf

The U.S. Environmental Protection Agency has a variety of Smart Growth publications:
www.smartgrowth.org/pdf/this_is_smart_growth.pdf

GreenBiz.com, Resource Center for Environmentally Responsible Building Development offers Greener Buildings
www.greenbiz.com/sites/greenerbuildings/index.cfm

The USC Center for Sustainable Cities offers a multidisciplinary research program that prepares doctoral students to confront, analyze and resolve the challenges posed by cities.
www.usc.edu/dept/geography/ESPE/.

Sustainable City is a non-profit organization dedicated to achieving a sustainable future for San Francisco.
www.sustainable-city.org/,
www.sustainable-city.org/Plan/Energy/intro.htm

In September 2005 the city of London adopted a Sustainability Policy which outlines the principles of sustainability,
www.cityoflondon.gov.uk/Corporation/living_environment/sustainability/



**NATURAL
CAPITALISM
SOLUTIONS**

**NATURAL CAPITALISMS SOLUTIONS IS A 501(c)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548**

Chapter 5:

Local Action Plan

Long Term Initiatives

Sustainable Agriculture

DOCUMENT CONTENTS

The Role of Agriculture in Global Warming.....	152
Solutions: Local Sustainable Agriculture.....	152
Government Incentives for Climate Protection Through Local Sustainable Agriculture.....	154
School Programs to Promote Local Sustainable Agriculture	155
Protect the Climate and Strengthen Local Economies.	156
Additional Resources	157

The Role of Agriculture in Global Warming

Agriculture contributes an estimated 20% of the greenhouse gases (GHGs) that are responsible for global warming.⁴⁶⁸ Plowing the soil causes the release of significant amounts of carbon previously fixed in soil structure by speeding the microbial activity that causes decomposition of the organic matter in the soil. Conventional farming activities also release substantial amounts of methane and nitrous oxide. Methane is produced by the decomposition of organic matter like crop residues and also by the digestive processes of grazing livestock like cattle. The excessive use of nitrogen fertilizer contributes to the emission of nitrous oxide. Agriculture is responsible for about 50% of human-related methane emissions and 70% of nitrous oxide emissions.⁴⁶⁹

Because the average molecule of food travels 1500 miles before someone eats it, the transport of agricultural goods also releases CO₂.

Solutions: Local Sustainable Agriculture

Local governments can significantly reduce their community's contribution of GHGs by supporting local sustainable agriculture. Locally produced fruits, vegetables, dairy products and other agricultural goods require far less transportation than products shipped into the community over long distances. They can also be grown in ways that substantially reduce emissions of GHGs.

⁴⁶⁸ International Food Policy Research Institute, www.ifpri.org/pubs/books/ufo/ufa_ch24.pdf#search=%22tilling%20and%20global%20warming%22, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Agriculture/UFA_ch24.pdf, 3 October 2006.

⁴⁶⁹ International Food Policy Research Institute, www.ifpri.org/pubs/books/ufo/ufa_ch24.pdf#search=%22tilling%20and%20global%20warming%22, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Agriculture/UFA_ch24.pdf, 3 October 2006.

Low-till or no-till farming, a practice called conservation tillage, does not disrupt the soil as much as heavily mechanized tilling practices, allowing the soil to retain a much higher percentage of the carbon that is naturally fixed within it. This also reduces CO₂ emissions released from farm equipment used to till the fields. In addition to reducing the amount of carbon released, conservation tillage reduces the soil's exposure to wind and water erosion, increases options for multiple cropping, improves the soil's ability to retain moisture, and moderates the soil's temperature.⁴⁷⁰ Farmers can even be paid, through a program conducted by Chicago Climate Exchange for converting their land to no or low-till practices.⁴⁷¹

An estimated 38% of the country's total farmland (109 million acres) uses conservation tillage practices, according to the group Conservation for Agriculture's Future (Core 4).⁴⁷² It is an especially attractive practice for smaller, local operations. Organic farming

reduces or eliminates the use of industrially produced agro-chemicals that require significant amounts of oil and natural gas to produce, deliver and use. Organic farming methods improve soil productivity, reduce the potentially hazardous handling of chemicals and reduce water pollution. Sustainable farming also sequesters carbon in the soil by using organic wastes as fertilizer.

Organic farming is more energy efficient than conventional farming. A study begun in 1978 and released in 2006 by the Swiss government found organic farms to be 20-56% more energy efficient than conventional farms.⁴⁷³ Increased energy efficiency came in part from decreased fertilizer and pesticide use and decreased transportation of external animal feed sources.⁴⁷⁴ A U.K. government study found that, "Organic systems had a lower energy input largely because of an absence of indirect energy inputs in the form of nitrogen fertilizer." The study estimated that large organic arable production used 35% less

and organic dairy 74% less energy per unit of production when compared to conventional agriculture.⁴⁷⁵

Local operations are especially well suited to organic production. This can also confer significant competitive advantage to local farmers. Organic farming was a \$14.6 billion dollar industry in the U.S. in 2005 and continues to grow around 17% annually.⁴⁷⁶ By enabling local farmers to remain viable by entering this market, as well as to grow food for local consumption, a community is investing in the future of its farmers and ranchers, boosting local economic development and reducing the carbon footprint of its agricultural sector, and of its citizens as they feed their families.

A recent study by the U.S. Department of Agriculture's Agricultural Research Service (ARS)⁴⁷⁷ concluded that Minnesota grain farmers could make more money by switching to organic grain crops. With the 130 acre Swan Lake Farm as a

⁴⁷⁰ A conflict has existed between the practices of organic farming and conservation tillage. Organic farmers do not use chemical herbicides to control weeds and therefore have traditionally used mildly intensive tillage practices to turn weeds under the soil. Recent developments in low-till methods and alternative weed control methods are bringing conservation tillage and organic farming closer together. However, there is growing interest in organic no-till crop production.

⁴⁷¹ CCX Agricultural Soil Carbon Offsets, www.chicagoclimatex.com/news/publications/pdf/CCX_Soil_Offsets.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Agriculture/CCX_SoilOffsets.pdf, 30 October 2006.

⁴⁷² Conservation for Agriculture's Future, www2.ctic.purdue.edu/Core4/news/annn/CTfact.html, 3 October 2006.

⁴⁷³ Paul Mader, et.al., "Soil Fertility and Biodiversity in Organic Farming," *Science* magazine, 31 May 2002.

⁴⁷⁴ www.organicconsumers.org/organic/stabalize062404.cfm, 15 October 2006.

⁴⁷⁵ Mark Shepard et al, *An Assessment of Environmental Impacts of Organic Farming* www.defra.gov.uk/farm/organic/policy/research/pdf/env-impacts2.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Agriculture/Organic_Env-impacts.pdf, 15 October 2006.

⁴⁷⁶ Organic Trade Association, www.ota.com/pics/documents/short%20overview%20MMS.pdf#search=%22organic%20industry%20billion%22, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Agriculture/OTA_Survey_2006.pdf, 3 October 2006.

⁴⁷⁷ USDA Agricultural Research Service, July 25, 2006 www.ars.usda.gov/is/pr/2006/060725.htm, 3 October 2006.

representative farm, ARS researchers used four years of trial data to predict that over 20 years organic soybeans would fetch up to \$14 more per bushel, organic corn up to \$3 more per bushel, and wheat up to \$5 more. Another projection showed farmers netting an average of \$50-60 more per acre even if organic prices were to drop by half.⁴⁷⁸

According to a study by the leaders of the Consortium for Agricultural Soils Mitigation of Greenhouse Gases (CASMGs), such agriculture practices that reverse the decarbonization of the soil, and increase carbon sequestration by farmers in the U.S. could reduce the expected increase in CO₂ emissions by 20% per year.⁴⁷⁹

Government Incentives for Climate Protection Through Local Sustainable Agriculture

Many local governments are implementing programs to encourage local food production, increased use of organic produce and preservation of farmland. Some of these programs are designed to strengthen local economies, some to increase health and some to preserve a way of life. But all have the

effect of reducing global warming as well. Increasingly, local governments are linking the benefits of local production with the need for climate protection.

King County, Washington, the county that encompasses Seattle, preserves local farmland, in part to reduce the carbon footprint of agriculture, to enable residents to be more secure in their sources of food and to enhance and preserve the commercial viability of agriculture as an economic sector.⁴⁸⁰

Ron Sims, the visionary County Executive, described how the county's Greenprint for King County⁴⁸¹ would deliver many benefits beyond climate protection:

The Greenprint gives us a powerful tool to protect an additional 100,000 acres of open space and resource lands by 2010, and strengthen a green infrastructure capable of ensuring that King County's incredible natural assets are safeguarded for generations to come. King County currently owns more than 25,000 acres of lands and more than 106,000 acres of development rights for the purpose of preserving working forests, productive farms, rivers that are managed

to support salmon habitat, yet also reduce flood threats and a premier multi-modal, regional trail system.⁴⁸²

The county has partnered with national and local land protection organizations to establish this network of protected lands surrounding the urban areas of the county. It is also working with the four county region to encourage similar land protection to ensure local food security and to reduce the climate footprint of meeting its citizens' needs.

The policies needed to connect communities to local farmers are not complex or innovative. Something as simple as mandating the purchase of local and organic foods for government agencies, school districts and any other organization that use municipal funds for procurement of food will have a rippling effect on the local economy. Farmers will respond favorably to the expansion of a new market by providing more goods and more variety.

Woodbury and Cherokee County, Iowa have created policies to support local producers of organically grown agricultural products. Woodbury County instituted a Local Food

⁴⁷⁸ One criticism of organic agriculture is that production yields are not as high as traditional farming. Yields are often reduced as a farmer transitions from conventional production and learns the techniques of organic farming. The process of establishing healthy soil, which is the foundation of successful organic production can take as long as a few years. Once an organic system is in place, however, many organic producers have yields that are as large as or greater than those of conventional operations. According to a study by Holly Born of the National Center for Appropriate Technology (NCAT), average productivity per acre in organic systems is 90 to 93% that of conventional agriculture. With lower input costs and comparable productivity, organic agriculture can be just as profitable if not more so than conventional farms. For example, organic dairy farmers may see reduced average production in the herd, but their animals tend to live longer and require less veterinary care. www.leopold.iastate.edu/pubs/nwl/2006/2006-2-leoletter/rotations.htm, 3 October 2006.

⁴⁷⁹ Consortium for Agriculture Soils Mitigation of Greenhouse Gases, www.casmgs.colostate.edu/, 3 October 2006.

⁴⁸⁰ King County climate change news, www.metrokc.gov/exec/climate.htm, 30 October 2006.

⁴⁸¹ King County Greenprint, www.tpl.org/tier3_cd.cfm?content_item_id=18178&folder_id=262, 30 October 2006.

⁴⁸² King County News Release, dnr.metrokc.gov/dnrp/press/2005/0422Greenprint.htm, 30 October 2006.

Purchase Policy to “increase regional per capita income, provide incentives for job creation, attract economic investment, and promote the health and safety of its citizens and communities.”⁴⁸³ It mandates that all county agencies that regularly procure food as part of their operations purchase locally produced organic food. This includes the Woodbury County Jail, Work Release Center and the Juvenile Detention facilities.

Woodbury County also provides grants of up to \$50,000 each year in real property tax rebate incentives for farms that convert from conventional farming techniques to organic farming. The “Organics Conversion Policy” is designed to offset costs associated with establishing the new techniques and losses due to the three-year conversion period that is required in order to attain organic certification.⁴⁸⁴

Cherokee County, Iowa, followed Woodbury County’s “Organics Conversion Policy” with a county tax relief program of their own. It provides up to 100% relief of property taxes for up to five years to growers who convert from conventional

farming and become certified organic growers⁴⁸⁵. Farmers in the program will also receive support from the Iowa Department of Agriculture and Land Stewardship, the Leopold Center for Sustainable Agriculture, the Iowa State University Extension office and a network of regional organic growers. The Whole Foods stores in the region provided additional help by promising to buy organic produce from the region indefinitely.

The program also hopes to make farming a more economically viable profession for young Iowans who want to stay in the area as farmers. An Iowa study showed that increasing consumption of locally grown produce would create an influx of an additional \$302 million in sales and more than 4,000 jobs added to the Iowa economy.⁴⁸⁶ The Environmental Quality Incentives Program (EQIP) was established within the 2002 Federal Farm Bill. EQIP is a federal program offering financial and technical assistance to implement structural and management practices on eligible agricultural land. USDA Natural Resources and Conservation

Service (NRCS) offices in several states across the country, including Minnesota, Nebraska, Iowa and Montana, offer cost-share incentive programs that help farmers transition from conventional agriculture to organic agriculture.⁴⁸⁷

In Montana, the state helps farmers convert by sharing the cost for organic crop transition, paying \$35 per acre for up to 100 acres for a maximum of three years. To help ranchers make their livestock operations organic the state pays \$3.50 per acre for up to 1,000 acres for a maximum of three years.⁴⁸⁸

School Programs to Promote Local Sustainable Agriculture

A growing number of school districts across the country are teaming up with local farmers and organic and local produce distributors to offer schoolchildren healthier options in their food programs, while encouraging local production. Schools in Washington State and California have introduced organic food as part of healthy school lunch programs. Thanks to the popularity and lower costs

⁴⁸³ Woodbury Organic Conversion Policy, www.woodbury-ia.com/departments/economicdevelopment/wc%20organics%20policyv4.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Agriculture/Woodbury_OrganicsPolicy.pdf, 3 October 2006.

⁴⁸⁴ Woodbury Local Food Purchase Policy, www.woodbury-ia.com/departments/economicdevelopment/WC%20LFPP%20v3.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Agriculture/Woodbury_LocalFoodPolicy.pdf, 3 October 2006.

⁴⁸⁵ Sioux City Journal, September 2006 www.siouxcityjournal.com/articles/2006/09/20/news/local/54322a2cf28dd753862571ef000a6c3a.txt, 3 October 2006.

⁴⁸⁶ Iowa State, Leopold Center, www.leopold.iastate.edu/pubs/staff/files/health_0606.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Agriculture/IowaState_economic_2006.pdf, 3 October 2006. For more information, contact: Rich Pirog, Marketing and Food Systems Initiative, (515) 294-1854, rspirog@iastate.edu or Dave Swenson, ISU Economics, (515) 294-7458, dswenson@iastate.edu or Laura Miller, Leopold Center communications, (515) 294-5272, lwmler@iastate.edu.

⁴⁸⁷ USDA Environmental Quality Incentives Program, www.nrcs.usda.gov/programs/eqip, 3 October 2006.

⁴⁸⁸ Montana NRCS, www.mt.nrcs.usda.gov/news/releases/progdeadline06-4.html, 3 October 2006.

of an organic salad bar at Lincoln Elementary School in Olympia, Washington, all grade schools in the city now have one.⁴⁸⁹ In 2004, the Seattle school district adopted a Breakfast and Lunch Program Procedure banning junk food and encouraging organic food in school cafeterias. California public school districts in Berkeley, Santa Monica and Palo Alto also have organic food programs.

Several states across the country use Farm to School programs to connect local farmers and their products with schools. Oklahoma's Farm to School Programs "provide schools with fresh and minimally processed farm commodities for inclusion in school meals and snacks, to help children develop healthy eating habits, and to improve Oklahoma farmers' incomes and direct access to markets,"⁴⁹⁰ as described in the legislation creating the programs. The bill lists the many benefits of Farm to School Programs, including "activities that provide students with hands-on learning opportunities, such as farm visits, cooking demonstrations and school gardening and composting programs, and integrating nutrition and agriculture education into school curricula."⁴⁹¹ Schoolchildren can use the programs to learn about healthy living and the importance of sustainable agricultural practices. The Farm to School

Programs provide guidance and resources to Oklahoma Schools so that they may partner with local farmers to provide healthy, locally grown food and the educational opportunity for schoolchildren.⁴⁹²

Protect the Climate and Strengthen Local Economies

People who eat locally grown food support local farmers and the local economy, while reducing GHG emissions from transporting food from long distances. Community initiatives that assist local farmers to make their practices more sustainable (i.e., converting to organics, attaining organic certification or implementing conservation tillage) can help the farming community significantly reduce its contribution to global warming. A community that expands its supply of sustainable and locally grown food will help protect the climate while promoting healthier lifestyles, a stronger local economy, cleaner air and water and greater community security.

⁴⁸⁹ Grinning Planet, www.grinningplanet.com/2006/05-02/healthy-school-lunch-article.htm, 3 October 2006.

⁴⁹⁰ Oklahoma Legislation, Farm to School Program Act www.oscn.net/applications/oscn/DeliverDocument.asp?CiteID=446211, 3 October 2006.

⁴⁹¹ Ibid.

⁴⁹² Farm to School Program, www.farmtoschool.org/, 3 October 2006.

Additional Resources

Leopold Center for Sustainable Agriculture

www.ag.iastate.edu/centers/leopold/

National Sustainable Agriculture Information Service

attra.ncat.org/

Stonyfield Menu for Change

www.stonyfield.com/MenuForChange/index.cfm

Organic Farming Research Foundation

www.ofrf.org/

Where does your food come from?

www.foodroutes.org/

Sustainable Food in Schools

www.sustainabletable.org/schools/dining/

Local Harvest

www.localharvest.org/



NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548

Chapter 5: Develop a Local Action Plan Long Term Initiatives Transition to Alternative Fuels

DOCUMENT CONTENTS

Biofuels	159
CASE STUDY:	
Washington, D.C.	159
Ethanol	160
Biodiesel	161
CASE STUDIES:	
Seattle and King County, WA	161
Channel Island National Park	162
Bi-Fuel and Compressed Natural	
Gas	163
Plug-In Hybrid Vehicles	164
CASE STUDY:	
Austin, TX	164
Federal Biofuel Tax Incentives	165
CASE STUDY:	
Sarasota, FL	166
Additional Resources	167

This section discusses the opportunities that may exist to use fuels other than the conventional, carbon intensive ones. High levels of uncertainty and risk in the international oil market have caused a tremendous amount of volatility in domestic oil prices over the past few decades. To hedge their bets against high energy prices, many cities have begun to diversify their fuel sources. Making such a switch has advantages to communities beyond reducing carbon. Most towns now spend approximately 20% of their gross income purchasing energy from outside the community. Approximately 80% of these dollars leave the community.⁴⁹³ In 2004, the United States consumed about 140 billion gallons of gasoline, or about 380 million gallons of gasoline per day in 2004, by far

the highest consumption rate of any country in the world. Consumption reached 400 million gallons per day in 2006. The 2005 Energy Policy Act⁴⁹⁴ introduced the Renewable Fuel Standard, which will nearly double the use of ethanol and biodiesel in the U.S. by 2012.⁴⁹⁵

Organizations such as the Post Carbon Institute work with communities to help them lay out a strategy for meeting their energy needs without reliance on imported oil.⁴⁹⁶

This section describes some of the strategies that communities can use to do this and lower transportation costs to consumers, achieve independence from imported oil and promote the development of a domestic fuel source industry.

⁴⁹³ "The Jobs Connection: Energy Use and Local Economic Development", Cities and Counties Project, U.S. Department of Energy, National Renewable Energy Laboratory, 1996., <http://www.localenergy.org/pdfs/Document%20Library/The%20Jobs%20Connection.pdf>, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/FuelTransition/JobConnection.pdf, 5 December 2006.

⁴⁹⁴ Energy Policy Act of 2005, www.doi.gov/iepa/EnergyPolicyActof2005.pdf, 5 December 2006.

⁴⁹⁵ Renewable Fuels Association, Federal Standards, www.ethanolrfa.org/policy/regulations/federal/standard/, 5 December 2006.

⁴⁹⁶ The Post Carbon Institute, www.postcarbon.org/, 5 December 2006.

Biofuels

Biofuels are forms of energy derived from recently living substances such as plants and animal by-products. They can include waste to energy, ethanol, bio-diesel and others. There is a potential to replace a significant amount of our current fuel use with biofuels. For example, the U.S. Department of Energy (DOE) hopes to displace 30% of the country's 2004 levels of gasoline demand with biofuels, mostly ethanol, by the year 2030. Other analysts believe that even more petroleum use can be displaced. If combined with much more efficient vehicles, this begins to be a strategy for helping communities escape

from dependence on expensive, polluting and insecure oil supplies.

The U.S. produced 3.4 billion gallons of ethanol in 2004 and around 75 million gallons of biodiesel in 2005, representing about 2% of total domestic gasoline consumption.⁴⁹⁷ Through federal tax incentive programs and market development initiatives, the U.S. government hopes to stimulate the growth of the alternative fuels market share. Part of this strategy includes mandates that federal vehicle fleets transition from conventional fuel vehicles to any number of alternative fuel vehicles (AFVs). Although not yet required by law, many local

governments have also begun to purchase AFVs for the same reasons.

This includes switching their vehicle fleets—maintenance trucks, shuttle buses, delivery vans, and other light-duty vehicles—from conventional internal combustion engine vehicles that consume only gasoline to AFVs that consume ethanol, biodiesel, electricity, gasoline or any combination therein. Since the fuels for AFV fleets can be produced domestically, there is much less volatility in price. Also, as the technology for producing alternative fuels improves, the prices should continue to go down.

Alternative Fuel Vehicles

CASE STUDY: Washington, D.C.

The Washington, D.C. metropolitan area has been classified by the U.S. EPA as an ozone non-attainment area. The primary cause of this air pollution is motor vehicle emissions. To reduce vehicle emissions, the City Administrator's Office began in 2004 requiring 90% of the city government's light-duty vehicle acquisitions to be AFVs.

Of the city's fleet of 5,500 vehicles, 329 are AFVs. Two-thirds of the light-duty AFVs are CNG vehicles, and one third are flex-fuel vehicles capable of fueling with gasoline or any mixture of gasoline and ethanol up to E85. One of the city's largest users of AFVs is the

parking enforcement division, which has a fleet of light-duty vehicles, of which 90% are AFVs. The AFV fleet refuels at two Department of Public Works fueling stations. A key card system encourages drivers to only refuel with alternative fuels at the designated stations. The city AFV fleet uses an estimated equivalent of 350,000 gasoline gallons of alternative fuels every year.⁴⁹⁸

The Metropolitan Council of Governments Alternative Fuels Committee has developed a "green policy" to serve as a template to assist members in implementing policies supporting

alternative fuels and other environmental initiatives. The committee offers workshops on alternative fuel technology, availability of AFVs and alternative fuel legislation. The city has been successful at emphasizing the benefits of AFVs and creating positive exposure by having the AFVs be a visible part of the community. They have also aggressively pursued grants and other sources of funding to offset the costs of the AFV program. Washington obtained grants from the National Ethanol Vehicle Coalition, the U.S. Department of Energy and the Washington Energy Office to install E85 tanks

⁴⁹⁷ U.S. Dept. of Energy Biofuels page, genomicsgtl.energy.gov/biofuels/transportation.shtml, 4 October 2006.

⁴⁹⁸ EPA Fleet Information and Regulations, www.eere.energy.gov/afdc/pdfs/37407.pdf#search=%22ethanol%20city%20policy%22, 4 October 2006. Archived: www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/FuelTransition/EPAact_fuel.pdf, 5 October 2006.

and equipment, a CNG fuel dispenser, and promotional materials.

Washington is currently seeking ways to expand its AFV use in heavy-duty vehicles like garbage trucks, dump trucks and street

sweepers. It is also working to expand the public availability of alternative fuels by contracting with privately owned fueling stations. Increasing the use of AFVs throughout the community will decrease vehicle emissions

and improve air quality in the Washington, D.C. area.

CONTACT

Ron Flowers
ronald.flowers@dc.gov

The transition of local government vehicle fleets to AFVs facilitates the expansion of AFV demand throughout the community.⁴⁹⁹ People see the vehicles and gain familiarity with them, and there will be increased accessibility to the vehicles in the local market and increased accessibility to publicly available, commercial refueling stations.

Although there are several different varieties of AFVs, the most common types are flex-fuel vehicles that run on a mixture of gasoline and ethanol, biodiesel vehicles, compressed natural gas vehicles and electric/hybrid vehicles. Each of these is discussed below.

Ethanol

Ethanol, or “ethyl alcohol,” is 200-proof grain alcohol that can be used as an alternative to gasoline. The majority of ethanol in the U.S. is made from corn, but it can also be made from other crops including wheat, barley, sorghum, potatoes

or sugarcane. New technology allows ethanol to be produced from cellulosic feedstocks, including corn stalks, oat husks, paper pulp, municipal solid waste, switchgrass and other sources.⁵⁰⁰ Most of the 4 billion gallons of ethanol produced in 2005 came from 13% of the U.S. corn crop, an increase in production of 17% from 2004.⁵⁰¹

Ethanol that is blended with unleaded gasoline at a ratio of 10% ethanol and 90% gasoline (E10) can be used in almost all vehicles without any special modifications. E85 (85% ethanol and 15% gasoline blend) is available mainly in corn-producing states and can be used as a substitute for gasoline in vehicles that are designated flex-fuel vehicles (FFVs). Because of the corrosive properties of this fuel mixture, the engine and fuel system in a flex-fuel vehicle must be specially adapted for alcohol fuels. Flex-fuel vehicles must also have a special sensor in the fuel line that analyzes the fuel mixture and controls the fuel injection and timing. Flex-fuel vehicles can use any mixture of ethanol-blended fuels up to E85

as well as conventional unleaded gasoline.

Ethanol and gasoline-ethanol blends cannot be transported by pipelines like conventional gasoline, but must be transported by train, barge or truck. Water in the pipelines can cause ethanol-gasoline blends to separate into two phases, making it difficult and expensive to remix the blend at the pumping station.

According to the Department of Energy’s Argonne National Laboratory, ethanol-blended fuels reduced CO₂ equivalent greenhouse gas emissions by 7.8 million tons in 2005.⁵⁰² The study also cited the following benefits from ethanol use:

Use of E10 achieves:

6% reduction in petroleum use,

1% reduction in greenhouse gas (GHG) emissions, and

3% reduction in fossil energy use.

⁴⁹⁹ Leiby and Ruben, The Alternative Fuel Transition, 2000, http://pzl1.ed.ornl.gov/tafv99report31a_ornl.htm.pdf, 5 December 2006.

⁵⁰⁰ BioCycle, 2005 News Bulletin, www.harvestcleanenergy.org/enews/enews_0505/enews_0505_Cellulosic_Ethanol.htm, 5 December 2006.

⁵⁰¹ U.S. DOE, Ethanol Technologies webpage, www1.eere.energy.gov/biomass/ethanol.html, 5 December 2006.

⁵⁰² “Effects of Fuel Ethanol Use on Fuel-Cycle Energy and Greenhouse Gas Emissions”, Argonne National Laboratory, www-db.research.anl.gov/db1/trdc/document/DDD/58.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/FuelTransition/FuelEthanol_1999.pdf, 4 October 2006.

Use of E85 achieves:

73–75% reduction in petroleum use,

14–19% reduction in GHG emissions, and

34–35% reduction in fossil energy use.

There is debate about the net energy balance of ethanol, given current production techniques. This is a comparison of the energy derived from a gallon of ethanol with the total amount of energy needed to produce it. Critics⁵⁰³ assert that it takes up to

70% more energy to fertilize, plant and harvest corn and to convert and transport the ethanol than the output energy derived from the ethanol. Supporters⁵⁰⁴ of ethanol disagree with these claims, pointing out that Exxon funded the proponents. They present data that suggests a positive net energy balance—with only 1.3 British thermal unit (BTU) of petroleum used to produce 1 BTU of ethanol. All such debates depend on the assumptions used about the crop that supplies the feedstock, the fermentation techniques used and the overall efficiency of the process.

Biodiesel

Biodiesel, a substitute for diesel fuel, is created by chemically reacting vegetable oils or animal fats with alcohol in a process known as transesterification. The majority of biodiesel in the U.S. comes from soybean oil or restaurant greases. The big advantage of biodiesel is that can be used in existing diesel engines with little or no modification, and can be blended at any ratio with petroleum diesel. In 2005, U.S. production of biodiesel was nearly 75 million gallons, an increase of 300% from 2004.⁵⁰⁵ Production was expected to reach 200 to 250 million gallons in 2006.⁵⁰⁶

Biodiesel

CASE STUDY: Seattle and King County, WA

More than half of King County Metro Transit's public buses use a B20 biodiesel blend as a part of a Seattle City Light greenhouse gas mitigation program.⁵⁰⁷ These 640 buses have been added to the fleet of hybrid buses, electric trolleys and clean-burning diesel vehicles. At existing diesel prices as of August 2006, King County pays an average of 34 cents a gallon less for biodiesel as compared to regular diesel fuel, which equates to about \$12,000 less a

week.⁵⁰⁸ Although price fluctuations will not guarantee this differential indefinitely, the expanded use of biodiesel provides a hedge against high fuel costs.

As part of its goal to becoming "greenhouse gas neutral," the city of Seattle has made a commitment to expanding the use of AFVs in its fleet. In addition to the Metro buses, King County's solid waste fleet and its wastewater biosolids trucks also

use biodiesel. They are currently working to develop a network of refueling stations across the county to facilitate the transition to a biodiesel fleet. Metro was recently honored as one of the country's top clean bus leaders by the Environmental and Energy Study Institute.

In addition to cleaner air and reductions in GHGs, King County and the Seattle City Light program hope their partnership will increase demand for

⁵⁰³ "Ethanol Fuels: Energy Balance, Economics and Environmental Impacts are Negative, D. Pimentel, www.ethanol-gec.org/netenergy/neypimentel.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/FuelTransition/Ethanol_2002.pdf, 4 October 2006.

⁵⁰⁴ "A Rebuttal to "Ethanol Fuels: Energy, Economics and Environmental Impacts" by D. Pimentel", Graboski & McClelland, www.ncga.com/ethanol/pdfs/EthanolFuelsRebuttal.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/FuelTransition/EthanolFuelsRebuttal.pdf, 4 October 2006.

⁵⁰⁵ U.S. Dept. of Energy Biofuels page, genomicsgtl.energy.gov/biofuels/transportation.shtml, 3 October 2006.

⁵⁰⁶ National Biodiesel Board, nbb.grassroots.com/07Releases/gov/, 15 November 2006

⁵⁰⁷ Seattle City Light GHG Mitigation Program helps pay for the cost of biodiesel in local transportation fleets using trucks, buses, garbage trucks, and ferries. Partnering with large users of petroleum fuels leverages Seattle City Light's greenhouse gas mitigation efforts by helping to build demand for biodiesel. www.seattle.gov/light/conserve/globalwarming/, 30 October 2006.

⁵⁰⁸ King County News Release, www.metrokc.gov/exec/news/2006/0817biodiesel.aspx, 3 October 2006.

biodiesel throughout the local community. The industry has grown rapidly and may reach a point where commercial-scale production is an economically viable option in the State of Washington. King County hopes

its increased consumption of biodiesel will help stimulate the production of farm commodities that are used to manufacture biodiesel, creating benefits for local farmers and the local economy.

CONTACT

Director
Harold S. Taniguchi
King County Department of
Transportation
(206) 684-1481

The use of B20 (20% biodiesel mixed with 80% diesel) in a conventional diesel engine results in substantial reductions of unburned hydrocarbons, carbon monoxide, sulfur oxides and sulfates, and particulate matter compared to emissions from diesel fuel.⁵⁰⁹ Emissions of nitrogen oxides are slightly increased. B20 reduces carbon dioxide emissions by 15%. Neat biodiesel (100% biodiesel) reduces carbon dioxide emissions by more than 75% over petroleum diesel.⁵¹⁰

Advantages to biodiesel:

Reduces our dependency on fossil fuel imports

Reduction of carbon monoxide emissions of 10% (B20) and 50% (B100).

Biodegradeable

Significantly decreases net greenhouse gas inputs, because the crops soak up carbon dioxide from the atmosphere as they grow. The resulting biodiesel releases some CO₂, but some of the carbon is sequestered in the soil, especially if the feedstock is grown using poly-cultures of perennials.⁵¹¹

Only alternative fuel that requires little or no

modification to the engine or fuel system

Disadvantages to biodiesel:

Biodiesel tends to gel at lower temperatures. Biodiesel vehicles can therefore have cold start problems relative to petrodiesel, but this is more of an issue for B100 than B20. B20 freezes at 3 to 5 degrees Fahrenheit, while B100 can freeze at 25 degrees Fahrenheit.

Biodiesel fuels will soften and degrade certain types of elastomers and natural rubber compounds over time.⁵¹²

Biodiesel

CASE STUDY: Channel Island National Park

After implementing various renewable technologies at Channel Island National Park⁵¹³ throughout the year (CNG vehicles, wind, solar) Kent Bullard was faced with the reality that although the National Park

was quite sustainable the coast guard and the diesel ships used to transport fuel were using almost 16,000 lbs of diesel each year. At first, Ken's solution was to bring 300 gallon fuel tanks of B20 onto the island each year to

supply the various vehicles and generators. After realizing there was a greater need for biodiesel, Ken worked out a deal with a fuel dock at Ventura Harbor⁵¹⁴ to carry B100.

⁵⁰⁹ National Biodiesel Board, www.biodiesel.org/pdf_files/fuelfactsheets/RegulatedFleet_QA.pdf, also archived at http://www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/FuelTransition/RegulatedFleet_QA.pdf, 3 October 2006.

⁵¹⁰ DOE Alternative Fuels Data Center, www.eere.energy.gov/afdc/altfuel/bio_benefits.html, 3 October 2006.

⁵¹¹ Iowa State University's Bio-economy program has shown how to do this, www.iastate.edu/~biorenew/, 5 December 2006.

⁵¹² World Energy, Advantages of Biodiesel Use for Emissions Reductions and Regulatory Compliance, www.epa.gov/air/caaac/mstrs/ciampa.pdf#search=%22advantages%20to%20biodiesel%22, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/FuelTransition/ciampa.pdf, 5 October 2006.

⁵¹³ Renewable Energy Applications at Channel Island National Park, www.nps.gov/archive/chis/energy.htm, 29 September 2006.

⁵¹⁴ Ventura Harbor Marine Fuel, www.vhmf.com/, 3 October 2006.

Because Channel Island did not have enough land to establish their own facility, they had to work with a public facility. Once the fuel dock was up and running, Channel Island initially provided 98% of the dock's business. Once biodiesel was available, other businesses and ships began to come to Ventura Harbor just to access the B100 dock. Earth Race stopped by Ventura Harbor on September 5th, 2006 on its world tour to promote renewable energy.⁵¹⁵

In town, a gas station also adopted B100 fuel. This station was recently shut down, but not for lack of customers. In fact, without the gas station present, vehicles can now be seen

backing up to the fuel dock to fill up with B100.

Not only has the local community picked up on the new renewable technology, Kent Bullard has worked to extend his enthusiasm for biodiesel to other communities in California. In January 2006, Kent help start a LA Biodiesel Coop.⁵¹⁶ Originally starting with 30 members, the group provided B99 and B100 biodiesel made from California walnut oil to members through a mobile trailer. The goal of the coop was to:

Provide a renewable fuel
Educate others about the
benefits of biodiesel

Show a market demand
existed for biodiesel

Put themselves out of
business when a stationary
fueling station decided to
distribute biodiesel

Within two months, the group had established a stationary supplier in Calvert City and within the first month the station pumped 4600 lbs of B100.

CONTACT

Kent Bullard
Channel Island National Park
(805) 658-5745
kent_bullard@nps.gov

Bi-Fuel and Compressed Natural Gas

A bi-fuel vehicle has two separate fuel systems, one for gasoline or diesel and another for either liquefied propane gas (LPG) or compressed natural gas (CNG). CNG and LPG are stored in pressurized tanks and therefore require special systems that increase the cost of bi-fuel vehicles and reduce overall cargo space.

CNG is one of the cleanest alternative fuels. Compared to conventional gasoline, CNG produces 90% less carbon

monoxide and 60% less nitrogen oxides. It also produces 30-40% less CO₂.⁵¹⁷

According to the U.S. Department of Energy, the advantages to CNG vehicles are:⁵¹⁸ Natural gas vehicle can be less expensive to operate than a comparable conventionally fueled vehicle depending on natural gas prices. Natural gas can cost less than gasoline and diesel (per energy equivalent gallon); however, local utility rates can vary.

Purchase prices for natural gas vehicles are somewhat higher than for similar conventional

vehicles. The auto manufacturers' typical price premium for a light-duty CNG vehicle can be \$1,500 to \$6,000, and for heavy-duty trucks and buses it is in the range of \$30,000 to \$50,000. Federal and other incentives can help defray some of the increase in vehicle acquisition costs. In addition, fleets may need to purchase service and diagnostic equipment if access to commercial CNG/LNG vehicle maintenance facilities is not available. Retrofitting⁵¹⁹ a conventional vehicle so it can run on CNG may cost \$2,000 to \$4,000 per vehicle. Learn more about NGV tax incentives.⁵²⁰

⁵¹⁵ The Earthrace, www.earthrace.net/, 3 October 2006.

⁵¹⁶ Biodiesel Coop, www.biodiesel-coop.org/, 3 October 2006.

⁵¹⁷ DOE Alternative Fuels Data Center, Natural Gas, www.eere.energy.gov/afdc/altfuel/gas_benefits.html, 3 October 2006.

⁵¹⁸ DOE Alternative Fuels Data Center, Natural Gas Vehicles, www.eere.energy.gov/afdc/afv/gas_vehicles.html, 5 October 2006.

⁵¹⁹ DOE Alternative Fuels Data Center, Aftermarket Alternative Fuel Vehicle Conversions www.eere.energy.gov/afdc/afv/conversion.html, 5 October 2006.

⁵²⁰ DOE Alternative Fuels Data Center, State and Federal Incentives, www.eere.energy.gov/afdc/laws/incen_laws.html, 5 October 2006.

Plug-In Hybrid Vehicles

Hybrid vehicles use both internal combustion engines and electricity from batteries for propulsion. A new variety of

hybrid vehicle, the plug-in hybrid or PHEV, uses the battery primarily and the Internal Combustion Engine (ICE) as a supplement only when needed. The first prototypes of the PHEV were released in November

2005. There is considerable promise for the growth of the domestic market. The city of Austin, Texas and the state of California are just two of the governments promoting the use of PHEV.⁵²¹

Plug-in Hybrids

CASE STUDY: Austin, TX

The city of Austin has begun to promote the widespread use of PHEVs as part of its commitment to reducing vehicle emissions. Initiatives currently being undertaken by the city include:

Creating an incentive program to encourage residents to purchase PHEVs

Developing and supporting policies that promote PHEVs

Requesting the help of community organizations to advocate for PHEVs

Initiating Plug-In Partners, a nationwide effort to establish similar incentive programs in the 50 largest cities in the United States

The city of Austin's municipal-owned electric utility, Austin Energy, stands to benefit from

the widespread use of PHEVs. Since plug-in hybrids would mainly be plugged in during the night, Austin energy could utilize its off-peak nighttime load to supply the new PHEV market without having to increase its capacity at all. Providing the electricity to the transportation market could provide substantial revenue to Austin Energy.

Replacing conventional vehicles with PHEVs would increase the urban air quality throughout the city. Idling engines produce high levels of CO₂ and other pollutants, while PHEVs running on battery power do not idle at all in the city. The overall benefit of PHEVs could be increased by coupling the use of wind power, which is most prevalent at night, to recharge PHEVs.

Mayor Will Wynn of Austin has begun a nationwide program

called Plug-In Partners, in which he hopes to create similar programs in the 50 biggest cities in the country. The idea of the program is to create a groundswell of demand for PHEVs on a magnitude sufficient enough to entice the automotive industry to begin mass production of PHEVs. As part of the Plug-In Partners campaign, potential consumers can sign a petition pledging to buy a PHEV once they are available in order to demonstrate widespread demand for the new technology.⁵²²

CONTACT

Plug-In Partners
c/o Daryl Slusher/ Lisa Braithwaite
721 Barton Springs Rd.
Austin, TX 78704
(512) 322-6210 or
(512) 322-6511

⁵²¹ The California Cars Initiative, www.calcars.org/, 5 December 2006.

⁵²² For more information on Austin

- Austin Energy Plug-In Hybrid Program www.austinenenergy.com/About%20Us/Environmental%20Initiatives/Plug-in%20Hybrid%20Vehicles/index.htm, 3 October 2006.
- State Energy Alternatives, www.eere.energy.gov/states/alternatives/, 3 October 2006.
- CalCars, The California Cars Initiative, www.calcars.org/calcars-news/115.html, 3 October 2006.

PHEVs are most likely to be introduced as fleet vehicles. They can be vehicles of any size, including delivery vans, shuttle buses and maintenance vehicles, among others. With daily routes typically less than 20 miles, most PHEV fleet vehicles used by a local government may almost never need to visit a gas station. If the vehicle exceeds the limits of the battery power, the PHEV will automatically switch to its internal combustion engine/battery combination and operate as a typical hybrid.

A typical PHEV sedan can be charged through a 120-V outlet in 3-4 hours, while larger vehicles can be charged in the same amount of time on a 240-V connection.⁵²³ Assuming a PHEV drives 20 miles a day for five days a week solely on its batteries, it will use around 2000-2500 kWh of electricity to cover

5000 miles. At current prices, total electricity costs amount to about \$170-\$215 annually, compared to annual fuel costs for the same amount of driving of \$750-\$825 (at 18 miles a gallon).⁵²⁴ Assuming national average cost of electricity at 8.5cents per kilowatt hour, a PHEV runs on an equivalent of 75 cents per gallon.⁵²⁵

Widespread use of PHEVs could significantly reduce urban emissions. Idling in urban driving situations accounts for about 10-15% of total vehicle carbon emissions⁵²⁶, and PHEVs under normal conditions (short trips at moderate speeds) do not use their ICE.

PHEVs can be recharged at night when the electricity from utilities is underutilized. This could create a significant new market

for off-peak electricity. Roger Duncan, deputy general manager of Austin Energy, asserts that the national power system could charge tens of millions of PHEVs without requiring any new production capacity due to the idle electricity load at night.⁵²⁷ Also, wind energy that is generated mostly during the night could be coupled to PHEV charging to provide a zero-emissions source of electricity. According to the California Air Resources Board, a vehicle that runs exclusively on battery power generates only a third of the GHGs produced by an equivalent gasoline vehicle.⁵²⁸

Federal Biofuel Tax Incentives

Comprehensive Guide to Federal Biofuels Incentives⁵²⁹

Tax Incentives	Agency	Benefit	Qualified Applicant	Period
Volumetric Ethanol Excise Tax Credit	IRS	\$0.51 per gallon	Blenders of ethanol with gasoline	▪ Expires 2010
Small Ethanol Producer Credit	IRS	\$1.10 per gallon of ethanol produced of first 15 million gallons of ethanol made by a small producer	Any producer with production capacity below 60 million gallons	▪ Expires end of 2007
Biodiesel Excise Tax Credit	IRS	\$1.00 per gallon \$0.50 per gallon (recycled grease)	Biodiesel producers and blenders	▪ Expires 2010
Small Producer Biodiesel Credit	IRS	\$1.10 per gallon of ethanol produced of first 15 million gallons of ethanol made by a small producer	Any producer with production capacity below 60 million gallons	▪ Expires end of 2007
Credit for Installation of Alternative Fueling Stations	IRS	Credit for 30% of the cost to install alternative refueling stations; E85 and B20 fueling stations would qualify	Taxpayer who places the refueling property in service	▪ Effective: Dec. 31, 2005 ▪ Expires: Dec. 31, 2009

Figure: Biofuel Tax Incentives⁵³⁰

⁵²³ Lucy Sanna, *Driving the Solution: the Plug-In Hybrid Vehicle*, EPRI Journal, Fall 2005, p. 5, www.calcars.org/epri-driving-solution-1012885_PHEV.pdf, also archived at, [www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Fuel Transition/CalCars_plugin.pdf](http://www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Fuel%20Transition/CalCars_plugin.pdf), 3 October 2006.

⁵²⁴ Ibid.

⁵²⁵ Ibid.

⁵²⁶ Ibid.

⁵²⁷ Ibid.

⁵²⁸ Ibid.

⁵²⁹ Federal Biofuel Incentives

[cantwell.senate.gov/services/Biofuels/Comprehensive Guide to Federal%20Biofuel Incentives.pdf#search=%22biofuels%20federal%22](http://cantwell.senate.gov/services/Biofuels/Comprehensive_Guide_to_Federal%20Biofuel_Incentives.pdf#search=%22biofuels%20federal%22), also archived at, [www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Fuel Transition/FederalBiofuel_Incentives.pdf](http://www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Fuel%20Transition/FederalBiofuel_Incentives.pdf), 3 October 2006.

⁵³⁰ Ibid.

CASE STUDY: Sarasota, FL

Sarasota County is the first community in the country to join the National Renewable Energy Laboratory's "Renewable Community" program. This demonstration project integrates the use of rooftop photovoltaic (PV) systems on super high-efficiency homes with plug-in hybrid vehicles. Zero-Energy Homes (ZEHs) must be efficient enough to consume no more power annually than a small photovoltaic system can supply. Energy from the PV system is also used to charge the batteries of plug-in hybrid vehicles.

The objective of the Renewable Community program is to

showcase the potential integration of efficient buildings, renewable energy and the latest technology in clean vehicles.

Several state and federal financial incentives have contributed to the implementation of this program.

This type of integration on a community level could significantly reduce our dependence on imported oil and reduce the country's overall contribution of GHGs.⁵³¹

The Florida Energy Act provides rebates to consumers for solar installations.

The Florida legislature appropriated \$2.5 million in funding for both commercial and consumer solar incentives for 2006-2007.

The Federal Energy Bill offers a 30% tax credit to individuals for the purchase of residential solar energy systems and a \$2000 tax credit to homebuilders of houses that are 50% more efficient than the national code

CONTACT

Nina Powers
(941) 861-5651
npowers@scgov.net

⁵³¹ For more information on Sarasota

- NREL Presentation on Renewable Communities www.solar2006.org/presentations/forums/f15-penney.pdf#search=%22renewable%20community%22, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/FuelTransition/NREL_plugin.pdf, 3 October 2006.
- Sarasota County Press Release scg.co.sarasota.fl.us/Media/media_documents/scgovFACTS.pdf#search=%22renewable%20community%22, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/FuelTransition/Sarasota_plugin.pdf, 3 October 2006.
- www.floridagreenbuilding.org/news/news2006/jun2006.htm, 3 October 2006.
- National Renewable Energy Laboratory on PHEVs www.nrel.gov/vehiclesandfuels/hev/plugins.html, 3 October 2006.

Additional Resources

Alternative Fuel Vehicles

www.fueleconomy.gov/feg/current.shtml

Clean Cities

www.eere.energy.gov/cleancities/

Alternative Fuel Station Locator

afdcmap2.nrel.gov/locator/

Driving the Solution: the Plug-In Hybrid Vehicle by Lucy Sanna

EPRI Journal, Fall 2005

www.calcars.org/epri-driving-solution-1012885_PHEV.pdf

Oak Ridge National

Laboratory Report: The Alternative Fuel Transition: Results from the TAFV Model of Alternative Fuel Use in Light-Duty Vehicles 1996-2010
www1.eere.energy.gov/vehiclesandfuels/epact/pdfs/plf_docket/tafv99report31a_ornltnm.pdf

Comprehensive Guide to Federal Biofuels Incentives

cantwell.senate.gov/services/Biofuels/Comprehensive_Guide_to_Federal%20Biofuel_Incentives.pdf#search=%22biofuels%20federal%22

Biodiesel Fact Sheet

www.biodiesel.org/resources/fuelfactsheets/

Set America Free

www.setamericafree.org/

Natural Resources Defense Council—Growing Energy:

How Biofuels Can Help End America's Oil Dependence

www.nrdc.org/air/energy/biofuels/contents.asp

Powerpoint from NREL about the plug-in hybrid system.

sustainablecommunities.scgov.net/ssDocuments/1270/powerpoint/transportation.ppt

Seattle's Clean and Green Fleet Action Plan

www.seattle.gov/environment/Documents/CleanGreenFleetAP.pdf



**NATURAL
CAPITALISM
SOLUTIONS**

NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548



Chapter 5: Local Action Plan Long Term Initiatives Sustainable Energy

DOCUMENT CONTENTS

Planning for Sustainable Energy	168
How Does Your Community Meet its Needs for Energy Now....	168
Envisioning a Sustainable Energy System.....	170
Efficient Use of Energy ..	170
Renewable Energy Sources	173
CASE STUDIES:	
State of California	175
State of New Jersey....	175
Santa Monica, CA.....	176
San Diego, CA.....	177
Chicago, IL.....	177
Bridging the Gaps Between Alternative Energy Scenarios	178
Best Renewable Energy Practices to Supply Fuel Examples.....	178
Delivering a Sustainable Energy Plan	180
Balancing the Existing Marketplace Away from Business-as-Usual.....	181
Primer on Sustainable Energy Sources	182
Primary Barriers to Address	187
Conclusion	188
Additional Resources	189

Planning for Sustainable Energy

Every community can move toward supplying its energy in ways that are clean, secure, affordable, and that meet citizens' needs abundantly. This is called a sustainable energy system. Achieving it will mean increasing the supply of energy that comes from locally based, renewable sources. It will also mean using sources of energy more efficiently. Many communities are already moving in this direction. You can, too.

How Does Your Community Meet its Needs for Energy Now

A good first step in developing a plan to meet a community's energy needs now and into the future is to understand how the community currently gets its

energy. Most citizens in a community have no idea where their energy comes from. Many have no idea that a typical community now spends as much as 20% of its gross income buying energy. Because most of this energy comes from outside the community, 80% of those dollars immediately leave the local economy. This means that most towns are slowly bleeding to death economically.

Achieving a sustainable energy future will require putting in place a very different energy supply system than most cities have now. On average for the U.S. communities use very little renewable energy. The Department of Energy (DOE) estimates that the U.S. in 2004 got only 5.7% of its energy from renewable sources. Business as usual projections forecast that the U.S. would get only 1% more renewable energy by 2030.⁵³²

⁵³² U.S. DOE, U.S. Energy Information Administration, "Annual Energy Outlook 2006," p. 11. The EIA also forecasts annual world energy consumption growth by fuel to 2030 as follows (reference case IEO2006 model): Oil – 1.5%; Natural Gas – 2.5%; Coal – 2.5%; Nuclear – 0.9%; Renewable/other – 2.4%. This projects an overall annual growth of energy consumption of 2%. Source: Energy Information Administration, "International Energy Outlook 2006," June 2006. Both sources available at www.eia.doe.gov, 30 October 2006.

U.S. Primary Energy Sources	2004	2030 (projected)
Petroleum products	40.3%	40.0%
Natural Gas	23.2%	20.7%
Coal	22.6%	25.7%
Nuclear Power	8.2%	6.8%
Renewable Energy	5.7%	6.7%

Table: Business as Usual Energy Projections

The projection from the Energy Information Administration (EIA) for 2030 could also be called the “do-nothing” option. It illustrates that little progress towards using renewable energy can be expected without deliberate action on the part of cities, regions, states and the federal government. But as described throughout this manual, change is coming. The way we currently meet our energy needs will not continue.

Nearly 40% of primary energy used in the U.S. now goes to producing electricity. Most of this is coal that is burned in central station power plants, contributing to global warming and producing enormous quantities of waste heat and pollution. The resulting electricity is then shipped through massive power lines to the final customers. In the whole process, well over two thirds of the original energy is lost. These huge inefficiencies in electrical

generation and distribution systems mean that electricity supplies only 16% of the energy that is delivered to customers.

The remaining 60% of primary energy is used directly in buildings, industrial processes and transportation. There are large inefficiencies in these uses as well. For instance, an automobile is approximately 1% efficient at converting the energy stored in fuel into actually moving the driver. All of the remaining energy produces heat and pollution.⁵³³ Following the 1979 oil price increase, tougher vehicle efficiency standards reduced U.S. use of oil 15% over the five years at the same time that the economy grew by 16%. Given that there are cars now on the road getting over 60 miles per gallon, and the vehicle fleet average is 21 MPH, there obviously remains a large scope for increased efficiency.⁵³⁴

In addition, existing energy systems are vulnerable.⁵³⁵ Recent estimates of the economic costs of ordinary power outages and power fluctuations in the U.S. put the cost of such disruptions as high as \$188 billion annually.⁵³⁶ This number would obviously be dwarfed by significant natural or terrorist disruptions.

In part because of this, many industries have moved to supply part or all of their own energy. By 2001, “non-utility” providers (an owner of electric generating capacity that is not an electric utility) were providing one-sixth of the nation’s electricity. There is a rapidly expanding marketplace for distributed energy.

Enormous economic and energy security benefits can be obtained through greater use of “distributed” energy sources, meaning energy sources physically close to, and matched

⁵³³ Because of heat and combustion losses, the engine, transmission, and tires (and other energy-consuming components such as options) of a standard automobile convert only 20% of the gasoline’s energy into movement of the vehicle. The people in the car may constitute only 5% of the weight of the car that is moved forward (150 lbs of 3000 lbs). Hence, 20% efficiency to move only 5% of the car’s weight means only 1% of the fuel’s energy moves the people forward. See Paul Hawken, Amory B. Lovins and L. Hunter Lovins, *Natural Capitalism – Creating the Next Industrial Revolution*, Little, Brown, 1999, p. 24, and generally Chapter 2: “Reinventing the Wheels.” Steve Heckerroth, a contributing editor to *Mother Earth News* and electric vehicle advocate, estimates that the lifecycle of carbon-based fuels used in internal combustion engines (the “sun to wheel efficiency of biofuels”) is only 0.01% to 0.07% – see Steve Heckerroth, “Why We Need Electric Cars,” *Mother Earth News*, October/November 2006.

⁵³⁴ CAFÉ (Corporate Average Fuel Efficiency) standards for vehicles enabled the country to increase the fuel efficiency of new U.S.-built cars 7 mpg in six years. Europe achieved similar savings but did it through higher fuel taxes rather than efficiency standards. Between 1977 and 1985, U.S. oil imports fell 42%, depriving OPEC of one-eighth of its market. The entire world oil market shrank by one-tenth; OPEC’s share was cut from 52% to 30%, driving down world oil prices. The U.S. alone accounted for one-fourth of that reduction. On average, new cars each drove 1% fewer miles, but used 20% fewer gallons. Only 4% of those savings came from making the cars smaller.

⁵³⁵ For a full discussion of the vulnerability of domestic energy systems see Lovins, A and Lovins H, *Brittle Power*, available for free download from www.natcapsolutions.org/resources.htm#ART, 30 October 2006.

⁵³⁶ Craig Morris, *Energy Switch – Proven Solutions for a Renewable Future*, New Society Publishers, 2006, p. 10, citing a report by Primen. Morris notes that power problems are much less in the EU, partly due to underground power lines.

in scale with end-uses.⁵³⁷ Most of current “distributed generation” is not renewable. Much of it is gas-fired cogeneration, but increasingly new additions of distributed generation feature solar or wind power.

U.S. Department of Energy
Assistant Secretary David
Garman notes:

Aside from its obvious environmental benefits, solar and other distributed energy resources can enhance our energy security. Distributed generation at many locations around the grid increases power reliability and quality while reducing the strain on the electricity transmission system.⁵³⁸

Envisioning a Sustainable Energy System

Before a town can decide what energy future it wishes to develop, its citizens need to be educated about the technologies that are available and in use in other communities. The community should also understand the costs associated with doing things in a different way and as well as the costs that inaction would impose. For all of the reasons outlined in this manual, continuing to meet our energy needs as we have in the past may not be an option. Failure to undertake an

aggressive transition to the best technologies now available will actually penalize a town. For instance, an examination of one utility’s reluctance to buy wind electricity instead of natural gas plants showed that the decision forced consumers to pay nearly \$200 million in unnecessary electricity bills over the past five years. If the utility had purchased wind, the bills would have been lower, and the community would have been on its way to a carbon neutral future.⁵³⁹

A community that wishes to meet the energy needs of its citizens without emitting GHGs must lay out a strategy for transitioning its energy supply from fossil fuels to renewable energy.⁵⁴⁰

Such a plan sets forth:

A vision of a sustainable energy system that will meet the community’s greenhouse gas (GHG) goals/limits and renewable energy goals;

A plan to meet the needs for vehicle fuels, electricity, and facility energy needs and production opportunities;

City/regional government’s intent to take short- and long-term renewable energy actions on a local and regional scale; and

Partnerships with key stakeholders: utilities, vehicle fuel providers, other levels of government, and major employers or energy users.

Efficient Use of Energy

A sustainable energy plan will be founded on the efficient use of energy. The actions presented in this manual to reduce emissions of GHGs are an excellent starting point. When undertaking an analysis of the opportunities to save energy it is wise to disaggregate energy use so that it is clear what kinds of energy different end-uses require. Studies that aggregate information into sectors such as residential or commercial make it hard to understand what programs will work best, and then what supply measures will enable users to run vehicles, or deliver power to computers most effectively.

Based on the actual needs of a community, a plan will describe where to get additional energy supplies once all the cost effective energy savings measures have been implemented. Fortunately, many studies have shown that it is possible to meet all of the energy needs of a dynamic growing industrial society using energy efficiently and deriving it from

⁵³⁷ Amory B. Lovins et al., *Small is Profitable – The Hidden Economic Benefits of Making Electrical Resources the Right Size*, Rocky Mountain Institute, 2002. Available at www.smallisprofitable.org, 30 October 2006.

⁵³⁸ Lovins, *Small is Profitable*, p. 47.

⁵³⁹ Jane E. Pater, “Wind On The Public Service Company of Colorado System,” *North American Windpower* magazine, October 2006, p. 44. The study conducted by the Interwest Energy Alliance found that Public Service Company of Colorado’s decisions to purchase 775 MW of wind power beginning 1999, which saved consumers over \$251 million 1999-2005, could have been 1,038 MW instead – which would have saved over \$438 million.

⁵⁴⁰ For more on this topic, see James Kunstler, *The Long Emergency – Surviving the End of Oil, Climate Change, and Other Converging Catastrophes of the Twenty-First Century*, Grove Press, 2005.

the various renewable forms of energy.⁵⁴¹

In most cases, new sources of energy are more expensive than older ones. A good strategy both for protecting the climate and for keeping your local energy bill lower is to buy enough energy efficiency to avoid the need to bring on new sources of power—for example, in the case of electricity, achieving “no load growth.” This is a relatively simple equation to manage: ensure that what the community invests in energy efficiency each year is sufficient to offset any population growth, economic growth and energy-use growth unrelated to the first two. So long as energy end-uses remain unregulated and/or customers do not see effective efficiency incentives, it can be expected that consumers will add devices such as plasma televisions (which use five times the energy of a regular television) and other energy-inefficient appliances that in the aggregate are costly to the community’s residents and businesses.

Proven examples of energy savings opportunities⁵⁴²:

Properly choosing office equipment and commercial and household appliances has saved over two-thirds of their energy use with the same or better service and comparable or lower cost.

Skilled retrofits have saved 70–

90% of office and retail lighting energy, yet the light quality is more attractive and the occupants can see better. In most cases, the better lighting equipment lasts far longer and so more than pays for itself by costing less to maintain.

Motors use three-fourths of industrial electricity, three-fifths of all electricity, and more primary energy than highway vehicles. This use is highly concentrated: about half of all motor electricity is used in the million largest motors, three-fourths in the three million largest. Since big motors use their own capital cost’s worth of electricity every few weeks, switching to more efficient motors can pay back quickly. This plus retrofitting the rest of the motor system saves about half its energy and pays back in around 16 months.

The chemical industry saved half its energy per unit of product during 1973–90 by plugging steam leaks, installing insulation, and recovering lost heat. Now it’s discovered that better catalysts and matching heat to the required temperature can often save 70% or so of what’s left, yet pay back within two years. Next-generation industrial plant design, now moving from the chemical industry into semiconductors, is uncovering 50–75% savings with lower

capital cost, faster construction, and better performance. Early adopters will prosper.

Many of these examples illustrate a new design concept: that whole-system engineering can often make it cheaper to save a larger than a smaller fraction of energy use. This typically comes from integrating the design of an entire package of measures so they do multiple duty (such as better design saving on both energy and equipment costs), or piggyback on renovations being done anyway for other reasons, or both. Good engineers think this is fun. Most economic theorists assume it is impossible.

Efficiency opportunities expand far into the future:

Just selling “waste” heat to other users could cost-effectively save up to about 30% of U.S. and 45% of Japanese industrial energy. (America’s power stations waste more heat than Japan’s total energy use.)

Still largely unexploited are new kinds of heat exchangers and motors, membrane separators and smart materials, sensors and controls, rapid prototyping and ultraprecision fabrication, and radically more frugal processes using enzymes, bacteria, and biological design principles.

⁵⁴¹ ASES, Tackling Climate Change in the U.S., www.ases.org/climatechange, 1 February 2007
NRDC, Reducing U.S. Oil Dependence A Real Energy Security Policy, www.nrdc.org/air/energy/fensec.asp, 1 February 2007
Apollo Alliance, www.fypower.org/pdf/ApolloAll_StateReport.pdf 1 February 2007
Nuclear Information and Resource Services, www.nirs.org/press/10-05-2006/1, 1 February 2007.
⁵⁴² This list is taken from Lovins, A and Lovins H, Climate Making Sense and Making Money, 1998, www.natcapsolutions.org/publications_files/climate_sense.pdf, 30 October 2006.

Saving materials also saves the energy needed to produce, process, transport, and dispose of them. Product longevity, minimum-materials design and manufacturing, recovery of any scrap not designed out, repair, reuse, remanufacturing and recycling together present a formidable menu of business opportunities that also save energy, pollution, mining, and landfilling. Japan cut its materials intensity by 40% just during 1973–84; but far more is yet to come. Americans throw away enough aluminum to rebuild the country's commercial aircraft fleet every three months, even though recycling aluminum takes 95% less energy than making it from scratch. Smart manufacturers now take their products back for profitable remanufacturing, as IBM did with computers in Japan and Xerox does with photocopiers worldwide.

Many energy savings reduce climatic threats from more gases than just CO₂. Advanced refrigerators, using vacuum insulation and helium-engine coolers, can save over 90% of the energy of a standard refrigerator, thus avoid burning enough coal to fill the refrigerator every year. They also eliminate climate-

and ozone-disrupting cfc's from insulation and refrigerant. Landfill and coal-mine gas recovery turns heat-trapping and hazardous methane emissions into a valuable fuel while making electricity that displaces coal-burning (see the chapter on waste management). Recycling paper (the average person in a rich country uses as much wood for paper, mostly wasted, as the average person in a poor country uses for fuel) saves it from turning into landfill methane, and also saves the fossil-fueled used in manufacturing and transportation. These and scores more examples represent business opportunities with multiple profit streams.

Best Practice Examples of Community End-Use Strategies:

The U.S. Federal Government conducts extensive programs to reduce energy end-use at facilities, with an overall goal of 2% annual reduction in each facility. This is achieved through systematic audits through operations such as the Federal Energy Management Program of the National Renewable Energy Lab and Oak Ridge National Lab.⁵⁴³ The Department of Defense's (DoD) Energy Policy includes a

goal of conducting energy savings with less than a ten years payback.⁵⁴⁴ The DoD's Energy Conservation Investment Program saves \$3-4 for every \$1 invested over the investment lifecycle.⁵⁴⁵

Leading companies pursuing best practices regarding end-use energy management include multi-national firms Interface Inc., DuPont Corp., STMicroelectronics, ALCOA, ALCAN, Wal-Mart, Honda and SC Johnson. Mid-size or small businesses include Hot Lips Pizza of Portland, OR; New Belgium Brewing of Ft. Collins, CO; the IGA Market in Sacramento, CA.⁵⁴⁶

Clean Air Cool Planet is a small, compelling organization dedicated to finding and promoting solutions to global warming. They're a great example of a small non-profit that is making impressive changes in the carbon emissions of all sorts of industries. They partner with companies (Timberland, Verizon, Harbec Plastics), campuses (Harvard, MIT, Yale) and communities in the Northeast to help them reduce their carbon emissions in ways that make financial sense.⁵⁴⁷

Leading academic institutions pursuing best practices include

⁵⁴³ For an overview of the U.S. Department of Energy's facilities program see "Department of Energy – Energy Conservation at Federal Facilities Report" at www.er.doe.gov/epic/docs/FedFacilitiesReport.pdf. Outstanding environmental management examples receive Closing the Circle awards, given annually, from the White House's Office of the Federal Environmental Executive – see www.ofee.gov, 30 October 2006.

⁵⁴⁴ The DoD policy to implement all projects with less than a 10 yr. payback is from "The Department of Defense Energy Manager's Handbook", prepared by the Intuitive Research and Technology Corporation, August 2005, available at www.acq.osd.mil/ie/irm/Energy/Energy%20Manager%20Support/EnergyManagerSupport.htm, 30 October 2006.

⁵⁴⁵ See Commander Rob Tomiak, "Department of Defense Energy Management Program", powerpoint presentation, 17 August 2005.

⁵⁴⁶ For other small business examples, see the EPA Energy Star awards for small businesses at www.energystar.gov/index.cfm?c=sb_success.sb_2006winners, 30 October 2006.

⁵⁴⁷ Clean Air- Cool Planet, www.cleanair-coolplanet.org/, 30 October 2006.

the University of Calgary, Canada; Tufts of Boston, MA.

Many utilities have programs similar to Nevada Power, which provides cash rebates for energy efficient appliances and air conditioners, and installs devices that reduce air conditioning electrical demand during summer peaks.⁵⁴⁸

The consumer-owned electric utility serving Gainesville, Florida decoupled profits from energy sales to help promote efficiency.⁵⁴⁹

Seattle adopted an energy building code in 2004 stronger than the International Energy Conservation Code standards.⁵⁵⁰

Berkeley requires energy saving retrofits when homes are sold or significantly upgraded.⁵⁵¹

Several cities, including Ashland, Oregon provide extensive assistance to homeowners for energy audits and energy-use upgrades.⁵⁵²

Energy efficiency can be implemented very rapidly, by either or both of two quite different methods.⁵⁵³ In the 1970s and '80s, as now, there were high or rising energy prices and a sense of urgency: During roughly 1975–85, most new U.S. energy-using

devices—cars, buildings, refrigerators, lighting systems, etc.—doubled their efficiency, improving at an annual rate averaging around 7%.

If all Americans saved electricity as quickly and cheaply as ten million people served by Southern California Edison Company did during 1983–85, then each year they'd decrease the forecast need for power supplies a decade hence by about 7%, at a cost to the utility around one-tenth that of today's cheapest new power stations.

In the 1980s, skillful utilities captured ~70–90+% of particular efficiency markets, mainly difficult ones like retrofitting house shells, in just one or two years.

During 1990–96, utility facilitation enabled electric customers in Seattle—with the cheapest electricity of any major U.S. city—to save electric load nearly 12 times as fast as those in Chicago, and electric energy more than 3,600 times as fast, even though Seattle electricity prices are about half of Chicago's. This conclusively shows that making an informed, effective, and efficient market in energy-saving devices and practices—as Seattle City Light's efforts helped to do—can fully substitute for a bare price

signal, and indeed can influence energy-saving choices even more than can price alone. That is, people can save energy faster if they have extensive ability to respond to a weak price signal than if they have little ability to respond to a strong one.

Investor-owned utilities, when rewarded for cutting bills, sold efficiency ever faster and more skillfully despite falling electricity prices. In 1990, New England Electric System captured 90% of a small-commercial pilot retrofit market in two months. Pacific Gas and Electric Company captured 25% of its entire new-commercial-construction market—150% of the year's target—in three months, so it raised its 1991 target...and captured all of it in the first nine days of January.

Renewable Energy Sources

Renewable energy generally means power that comes from natural processes such as sunlight, wind, water flows, or earth's natural heat sources (geothermal) and that are inexhaustible. These are also called clean energy sources. Whether these sources are truly *sustainable* depends on whether they take no more from the earth than can truly be renewed, whether they are produced in

⁵⁴⁸ Apollo Alliance, "New Energy for Cities – Energy Saving and Job Creation Policies for Local Governments," p. 1:21, www.apolloalliance.org/docUploads/new%5Fenergy%5Fcities%2Epdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/SustainableEnergy/ApolloAlliance_EnergyforCities.pdf, 30 October 2006.

⁵⁴⁹ Ibid. p. 1:24.

⁵⁵⁰ Ibid. p. 1:13.

⁵⁵¹ Ibid. p. 1:15.

⁵⁵² Ibid.

⁵⁵³ This list is taken from Lovins, A and Lovins H, *Climate Making Sense and Making Money*, 1998, www.natcapsolutions.org/publications_files/climate_sense.pdf, 30 October 2006.

ways that do not pollute and whether they are deployed in ways that respect people and nature. There are many ways to supply energy, but some, like nuclear power, are neither clean, safe nor cost-effective. Others like hydrogen are still experimental. Others like solar space satellites have unfortunate military applications, and are extremely costly. None of these are considered “clean technologies,” even though they may be argued to be renewable or non-carbon.

Sustainable energy planning does not necessarily mean that the municipal government must go into the energy business using municipal enterprises. This may be a good idea, and many cities are considering “municipalizing” their energy suppliers, but a city can equally well work with existing utilities to ensure that energy efficiency and renewable energy are made available for its citizens and to future generations.⁵⁵⁴

Some cities find that it is useful to work with their citizens to develop a long-term vision of what sustainability can mean for their community. Such a vision can motivate people and guide community investment. Without a vision, investments for incremental improvements may not achieve the economic and social advantages of a strategic

plan to meet the community’s needs sustainably.

What is a realistic but aggressive vision for maximizing renewable energy for your community by, say, 2025? How much change can actually be achieved in the next 20 years? A dramatically different future from the one foreseen by the U.S. Department of Energy, is both desirable and doable. Several organizations have offered maps for increasing sustainable energy use:

The Union of Concerned Scientists offers a Clean Energy Blueprint that would achieve by 2020:⁵⁵⁵

Renewable sources meeting 20% of U.S. electricity needs;

Consumer savings of \$105 billion per year;

Avoidance of 975 new power plants and billions of energy infrastructure costs (such as pipelines, etc.) and retirement of 180 old coal plants and nine major nuclear plants; and

Reduction of natural gas consumption by 18%, coal consumption by 60%, carbon dioxide emissions by 67%, sulfur dioxide emissions by 55%, and nitrogen oxide emissions by 55% from “business as usual” projections.

The Apollo Alliance plan for clean energy cities in the U.S. includes the following goals:⁵⁵⁶

Generate 25% of electricity from renewable sources;

Reduce oil consumption by 25% by 2025; and

Build efficient transportation systems and high-performance (green) buildings.

The Rocky Mountain Institute’s “Oil End-Game”⁵⁵⁷ plan proposes that the U.S. could eliminate its petroleum products dependence for energy through:

Highly efficient buildings and vehicles that double fuel efficiency (52% savings);

Domestic biofuels production (25%); and

Substitution of natural gas for the remaining petroleum (25%).

Numerous strategies developed both abroad and domestically illustrate proactive means of creating more sustainable energy policy. For example, the EU has adopted the Energy Intelligent Europe Initiative, tying European competitiveness and quality of life to a transition away from fossil fuels to energy efficiency and renewables.⁵⁵⁸

⁵⁵⁴ See Johnston, David Cay, Some Californians to Pick Their Utility at the Polls New York Times, 3 Nov 2006 www.nytimes.com/2006/11/03/business/03utility.html?_r=1&ref=science&oref=slogin, 30 October 2006.

⁵⁵⁵ Union of Concerned Scientists, with the American Council for an Energy-efficient Economy and The Tellus Institute, “Clean Energy Blueprint – A Smarter National Energy Policy for Today and the Future,” available at www.ucsusa.org, 30 October 2006.

⁵⁵⁶ The Apollo Alliance, “New Energy for Cities,” 2006, available at www.apolloalliance.org, 30 October 2006.

⁵⁵⁷ Amory B. Lovins et al., “Winning the Oil End Game – Innovation for Profits, Jobs and Security,” Rocky Mountain Institute, 2004; available from www.oilendgame.com, 30 October 2006.

⁵⁵⁸ The strategy was first laid out in Energy for the Future: Renewable Sources of Energy See p. 9, section 1.3.1. An Ambitious Target for the Union europa.eu.int/comm/energy/library/599fi_en.pdf, 30 October 2006.

The German Renewable Energy Act (2001) outlined a renewable energy strategy for that country. The German approach included the “eco-tax” (*Ökosteuer*) that raised gasoline costs by \$.18/gallon by 2004.⁵⁵⁹ The German Renewable Energy Act calls for reaching 20% of electricity and 10% of primary energy from renewable sources by 2020; and 50% of primary energy from renewable sources by 2050, through the following strategies:⁵⁶⁰

Fixed remuneration that gives incentives for renewable energy sources (ranging from \$.055/kwhr for wind to \$.574

for solar photovoltaic) that is reevaluated every two years

Simple and transparent structure

Incentives for continuous renewable energy cost reduction

High security for investors

No dependence on public budgets

Financed by energy utilities

Steps taken towards internalizing external costs

City and state governments in the U.S. are also adopting innovative strategies to promote renewable energy.

As of Spring 2006, 20 states plus the District of Columbia have adopted programs that mandate getting a certain percentage of electricity production from renewable sources.⁵⁶¹ These “renewable portfolio” programs encourage utilities and citizens to use more renewable energy. California and New Jersey have adopted particularly ambitious goals. Examples of U.S. renewable energy programs include:

Renewable Energy

CASE STUDY: State of California

California’s Solar Initiative (2005) aims to increase the amount of installed solar capacity on rooftops by 3,000 MW by 2017 with investor-owned utilities through:⁵⁶²

\$3.2 billion for photovoltaic and concentrated solar rebates;

Exempting low-income households from any rate increases associated with

the program and using 10% of the funds for projects for low-income households

CONTACT

Go Solar California
www.gosolarcalifornia.ca.gov/

⁵⁵⁹ According to Morris, following adoption of the Eco-tax, gasoline sales fell for four consecutive years and 87% of consumers want a car with higher gas mileage. Gas tax revenues were used to reduce non-wage labor costs such as health insurance.

⁵⁶⁰ Dr. Manfred Fischeidick, Wuppertal Institute, “The German Renewable Energy Act – Success and Ongoing Challenges,” 2004. Available at: www.wupperinst.org/download/renewables/ICORE.pdf, 30 October 2006.

⁵⁶¹ See map of state systems as of 2005 provided by U.S. Department of Energy at www.eere.energy.gov/states/maps/renewable_portfolio_states.cfm, 30 October 2006.

⁵⁶² The incentives apply only to investor owned utilities because the California PUC does not have jurisdiction over municipal utilities. See www.cpuc.ca.gov/PUBLISHED/News_release/52745.htm, 30 October 2006. www.seia.org/solarnews.php?id=93, 30 October 2006.

Renewable Energy

CASE STUDY: State of New Jersey

New Jersey's Clean Energy Program calls for 1,500 MW of solar electricity installations in the state by 2020 through.⁵⁶³

A Renewable Portfolio Standard of 6.5% by 2008 with a target of 20% by 2020.⁵⁶⁴

The Clean Power Choice program that offers consumers the option to purchase renewable electricity;

Financial incentives for high-performance green buildings

Creation and trading of "Solar Renewable Energy Certificates" which financially reward distributed energy producers who help utilities meet renewable portfolio requirements

Examples of renewable energy goals adopted by U.S. cities include:

Renewable Energy

CASE STUDY: Santa Monica, CA

The city of Santa Monica, California set goals and programs include:

100% renewable energy purchases by city operations

25% of community electricity from renewable energy sources by 2010, including 1% from distributed sources

Maximizing non-petroleum fuel use in city fleet vehicles (80% already achieved)

Posting "Sustainable City Progress Reports" on the internet that include pages on GHG emissions, energy use, renewable energy, and transportation

The 2006 "Community Energy Independence

Initiative," which will demonstrate how "energy efficiency, solar energy and distributed generation can work together effectively and how greater energy independence provides economic benefit to the community" through 50 pilot projects on buildings. These projects will lead to a city-wide effort.⁵⁶⁵

⁵⁶³ A report on the program found that overwhelming demand was causing significant rebate delays – see Steven Lacey, RenewableEnergyAccess.com, "The Price of Success – Inside the New Jersey Clean Energy Program, 12 October 2006, at www.renewableenergyaccess.com/rea/news/story?id=46172, 30 October 2006.

⁵⁶⁴ See New Jersey Clean Energy website: www.nicep.com, 30 October 2006.

⁵⁶⁵ City of Santa Monica Environmental Programs Division website, www.santa-monica.org/epd, 30 October 2006.

Renewable Energy

CASE STUDY: San Diego, CA

In 2003, the San Diego, California region adopted the “Regional Energy Strategy 2030.” This program articulates nine goals to “achieve an integrated approach to meeting the energy needs and supporting the prosperity” of the region. The goals address energy security, efficiency and sources, including:⁵⁶⁶

In-county capacity to generate 75% of summer electrical demand peaks (to be achieved by 2020);

Supplying 40% of electricity from renewable sources of which 50% are in-county;

Supplying 30% of peak electrical demand from “clean distributed” sources;

Reducing per capita electricity peak demand and total consumption to 1980 levels; and

Reducing natural gas per capita consumption by 15%.

Renewable Energy

CASE STUDY: Chicago, IL

Chicago, Illinois programs include:

The Chicago Solar Partnership, begun in 2000, which combines solar energy unit production in the city with city purchases of solar power and various financial incentives for business and residents to install solar panels;⁵⁶⁷

The Bike 2015 plan which encourages Chicagoans to make at least 5% of all trips less than five miles via bicycle, and also aims to reduce bicycle accidents;⁵⁶⁸

A goal to generate 20% of electricity for city facilities from renewable sources by 2010;

Home weatherization for low-income families; and

City support of Spire Solar Company so that jobs from solar manufacturing will be retained in Chicago, and the city will have access to solar cells.

⁵⁶⁶ San Diego Regional Energy Office, “Energy 2030 – the San Diego Regional Energy Strategy,” 2003, available at www.sdenergy.org, 30 October 2006.

⁵⁶⁷ The Chicago Solar Partnership web site, www.chicagosolarpartnership.com, 30 October 2006.

⁵⁶⁸ See www.bike2015plan.org/, 30 October 2006.

Bridging the Gaps Between Alternative Energy Scenarios

At present, most energy planning is done in a disintegrated fashion. Little connection (i.e., whole-system thinking) is drawn between the planning that is done to supply vehicle fuels and planning that ensures supply to residential and commercial facilities (electricity and direct consumption). Vehicle fuel is delivered by the private sector, partially in response to state and federal government taxes/incentives and regulations.

For example, vehicle fuel planning typically takes three forms:

Fuel production and distribution planning by private energy providers (e.g., petroleum companies and, increasingly, bio-fuel companies);

Air quality planning by local air quality boards or districts;

Alternative fuel plans created by state or local governments.

Communities can intervene in these systems to ensure that energy is supplied in ways that are cost-effective and secure.

Best Renewable Energy Practices to Supply Fuel Examples

Private sector:

- As of summer 2006, 65 privately owned biodiesel manufacturing plants had opened in the U.S. with 49 more under construction.⁵⁶⁹ In 2005, BP launched its “low-carbon energy” business, an \$8 billion investment over ten years to provide cleaner power sources.⁵⁷⁰ Through the U.S. Department of Energy’s Hydrogen Plan, BP, which produces 5,000 tons of hydrogen daily, collaborated with Ford Motor Co. and DaimlerChrysler in 2004 to build hydrogen fleet fueling stations in California, Florida and Michigan.⁵⁷¹ The company expects to complete engineering studies in 2006 of a hydrogen power plant in Carson, CA, using petroleum coke as a fuel. The carbon

emissions from converting natural gas to hydrogen (4 million tons per year) are planned to be sequestered underground.⁵⁷²

Air quality planning:

- The South Coast Air Quality Management District serving the Los Angeles metro area has an extensive Clean Fuels program that co-funds dozens of demonstration projects annually.⁵⁷³
- British Columbia government’s climate change plan includes programs of the air quality division designed to reduce GHGs and improve efficient use of vehicle fuels, including the “Scrap-it Program” that rewards demolition of older, highly polluting vehicles in exchange for rebates on cleaner vehicles and a goal for attaining 30% green vehicles in the government’s fleet by 2008. The program also publishes tests of hybrid performance.⁵⁷⁴

⁵⁶⁹ Information about the growth of biodiesel through private investments is available at the website of the National Biodiesel Board; www.biodiesel.org/resources/pressreleases/gen/20060629_willielsononpacificbiodieselopening.pdf, 30 October 2006.

⁵⁷⁰ BP Sustainability Report 2005 “Making Energy More,” www.bp.com/liveassets/bp_internet/globalbp/STAGING/global_assets/downloads/S/bp_sustainability_report_2005.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/SustainableEnergy/bp_report_2005.pdf, 30 October 2006.

⁵⁷¹ BP corporate website, press release 27 April 2004: www.bp.com/genericarticle.do?categoryId=2012968&contentId=2017980, 30 October 2006. The first Los Angeles area hydrogen fueling station was a partnership with the South Coast Air Quality Management District. BP has also invested in several hydrogen fueling sites in the EU.

⁵⁷² BP Sustainability Report 2005, p. 43., www.bp.com/liveassets/bp_internet/globalbp/STAGING/global_assets/downloads/S/bp_sustainability_report_2005.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/SustainableEnergy/bp_report_2005.pdf, 30 October 2006.

⁵⁷³ In 2004, the AQMD contributed \$15 million to the total of \$44 million that funded 63 projects including expansion of natural gas and hydrogen fueling infrastructure and natural gas vehicles. See www.aqmd.gov/tao/Demonstration/index.htm, 30 October 2006.

⁵⁷⁴ See “Weather, Climate and the Future – BC’s Plan” at www.env.gov.bc.ca/air/climate/cc_plan/pdfs/bc_climatechange_plan.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/SustainableEnergy/bc_climatechange_plan.pdf, 30 October 2006.

Alternative fuel plans⁵⁷⁵:

- Plug-in hybrid vehicles may be available in the U.S. market by 2008. These vehicles represent an opportunity for vehicle fueling to help (if such vehicles are recharged during off-peak electrical production hours) or hinder community energy security (if charging boosts existing peak demands). Both the State of California and the city of Austin, Texas have programs underway to encourage the use of plug-in hybrids.
- Hydrogen fuel-cell hybrid vehicles represent an opportunity for distributed power generation. The vehicles are small electric powerplants on wheels that could generate power for a facility or the electrical grid while parked, if a connection were supplied that delivered hydrogen, and delivered the resulting electricity to the larger electric grid.
- The “Hydrogen Highway Network Action Plan” project of the California Air Resources Board (2004) aims “to support and catalyze a rapid transition to a clean, hydrogen transportation economy” specifically co-funding for three hydrogen fueling stations and the state lease of hydrogen-fueled vehicles⁵⁷⁶

Residential and commercial facility energy planning differs by states. Sometimes it is highly regulated by agencies (e.g. public utility commissions or the Federal Energy Regulatory Commission). In other locales it is a function of the private sector’s handling of fuels.

Community-level facility energy end-use planning typically involves education and/or incentives that affect choices by end-users. Programs to encourage customers to use energy wisely this are described in this Manual’s Chapter 5, Residential Section.

Without such programs electric utilities are vulnerable to major system problems when the utility’s projection (guess) of total potential electrical demand falls short of actual demand. This happened to Los Angeles Water and Power in the summer of 2006 when it underestimated electrical demand during a summer heat wave by 500 MW and blackouts resulted.⁵⁷⁷ Had LA’s energy planning enabled customers to live in buildings that kept inhabitants comfortable without air conditioning, this problem would not have arisen, everyone’s bills would have been lower and far less carbon would have been emitted.

Programs to integrate the use of energy efficiency and renewable energy can deliver significant value to a community.

Sacramento Municipal Utility District. In 1989, Sacramento, California shut down its 1,000-megawatt nuclear plant. Rather than invest in any conventional centralized fossil fuel plant, the local utility met its citizens’ needs by investing in energy efficiency and such renewable supply technologies as wind, solar, biofuels and distributed technologies like co-generation, fuel cells, etc. In 2000, an econometric study showed that the program has increased the regional economic health by over \$180 million, compared to just running the existing nuclear plant. The utility was able to hold rates level for a decade, retaining 2,000 jobs in factories that would have been lost under the 80% increase in rates that just operating the power plant would have caused. The program generated 880 new jobs, and enabled the utility to pay off all of its debt.

Fort Carson Mountain Post in Colorado has set forth a plan to meet 100% of its energy needs with renewable energy by 2027⁵⁷⁸

⁵⁷⁵ For more information on alternative fuel vehicles see: autos.yahoo.com/green_center/.

⁵⁷⁶ See Executive Order S-7-04 of California Governor Schwarzenegger at www.hydrogenhighway.ca.gov/media/execorder_s704.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/SustainableEnergy/CA_execorder_s704.pdf, 30 October 2006.

⁵⁷⁷ The utility’s response to the blackouts was to increase its planning assumptions about the peak demands from its residential customers – shifting from one megawatt of power being able to serve 750 homes to only 650 homes. (For energy planning in the late 20th century, the general assumption was one megawatt for 1000 homes). Source: Sharon Bernstein and Amanda Covarrubias, “Heat Wave Caught DWP Unprepared,” *Los Angeles Times*, July 28, 2006.

⁵⁷⁸ Fort Carson sustainability program website, sems.carson.army.mil, 30 October 2006.

Delivering a Sustainable Energy Plan

Delivering cost-effective sustainable energy involves two essential tasks:

1. Moving the existing energy marketplace away from the business-as-usual scenario by reducing various market failures
2. Progressing on an investment path towards a sustainable energy future

In undertaking these tasks, it is good to solicit input from such community partners as utilities, vehicle fuel providers, other levels of government, and major employers or energy users

Balancing the Existing Marketplace Away from Business-as-Usual

Environmental economists have long noted a fundamental flaw in market prices: Most prices fall short of capturing the full costs of producing the product or service being offered.

Costs such as the impact of releasing carbon into the atmosphere, the cost of vulnerabilities of central electricity generation, and the various subsidies that the Federal government gives to make historic forms of energy like coal or oil look cheaper, are called

“externalities.” These impacts are massive, but are not reflected in the market prices of energy. One study estimated the externalities of coal-fired electricity to be approximately four times the market price—meaning that in a truthful marketplace, coal-fired electricity would be closer to \$0.21/kwhr instead of the present \$.04–\$.06 cents. For nuclear power, externalities are estimated at nine cents per kilowatt hour—nearly double the market cost of running existing plants.⁵⁷⁹

According to the U.S. Department of Energy, coal-fired electricity externalities include acid rain, urban ozone and global climate change.⁵⁸⁰ Other externalities include mercury pollution, radioactivity, pollution from mining, milling, transport and waste disposal, externalities from the use of water, and habitat losses or other ecosystem damage incurred during the coal lifecycle. In the past four decades, governments have slightly reduced price externalities by implementing regulations to protect the environment and reduce damage to human health. Even so, the majority of externalities listed above remain unresolved.

A case can be made that another externality of non-renewable

resources is the denial of that resource to future generations. Interface Inc. CEO Ray Anderson, one of many business leaders dismayed by the consequences of externalities, notes that externalities mean that the market alone cannot provide sufficient constraints on corporations’ tendency to cause harm. A true market, he argues, would force companies to include externalities in the price of their offerings.⁵⁸¹

In contrast, solar electricity is estimated to have externality costs of one cent per kilowatt hour, in addition to its current estimated costs of 15 to 20 cents. Wind energy is presently cost competitive with coal and nuclear, with similarly few externalities.⁵⁸²

To achieve a more balanced marketplace, communities can:

1. Use regulations and/or taxes/fees to increase the price of non-renewable energy and provide incentives to providers of clean energy sources of all kinds (e.g., to make solar energy panels with fewer toxic materials)
2. Use regulations and financial mechanisms to
 - Reduce the effective costs of renewable and in distributed energy

⁵⁷⁹ Externality estimates by Thomas Sundqvist, “Power Generation Choice in the Presence of Environmental Externalities,” Lulea University of Technology, 2002, at epubl.ltu.se/1402-1544/2002/26/index-en.html, 30 October 2006.

See also Thomas Sundqvist, Patrik Soderholm and and Andrew Stirling, “Electric Power Generation: Valuation of Environmental Costs” in *Encyclopedia of Energy*, Vol. 2, Elsevier Ltd., 2004, pp. 229-243. Mr. Sundqvist estimated coal-fired electricity externalities at \$.16/kwhr, nuclear power at \$.09/kwhr, and \$.01/kwhr for solar power. Current price of coal-fired electricity from Daniel M. Kammen, “the Rise of Renewable Energy,” *Scientific American*, September 2006, p. 86.

⁵⁸⁰ See John Carlin, “Environmental Externalities in Electric Power Markets: Acid Rain, Urban Ozone and Climate Change,” U.S. Department of Energy website: www.eia.doe.gov/cneaf/pubs_html/rea/feature1.html, 30 October 2006.

⁵⁸¹ For a cogent explanation of the set-up for corporations in the modern marketplace, including externalities, see Joel Bakan, *The Corporation – The Pathological Pursuit of Profit and Power*, Viking Canada, 2004. Anderson quotes from p. 72; also see DVD of the same name.

⁵⁸² See Renewable sources of energy, with special emphasis on wind energy, Report of the Secretary General, Committee on New and Renewable Sources of Energy and on Energy for Development, 1998, at www.uneprisoe.org/WindEnergy/UNreportwind.pdf, 30 October 2006.

- Increase the incentives for energy utilities and community citizens/organizations to invest in energy efficiency and renewable energy

Examples of leading-edge actions include:

Seattle City Light, the city of Seattle's public utility, has committed to be carbon-neutral. This utility is reducing its carbon footprint through use of renewable energy sources and purchasing carbon credits to achieve carbon neutrality. The scheme effectively prices its energy as if it had few externalities.⁵⁸³ Seattle City Light achieved zero net greenhouse gas emissions in 2005 and 2006.⁵⁸⁴

Thief River Falls, Minnesota, offers low interest loans and incentives to customers who install ground-source heat pumps—a less electricity intensive system for heating and cooling buildings.⁵⁸⁵

Santa Clara, California, rents solar hot water systems to citizens and businesses.⁵⁸⁶

Honolulu, Hawaii, offers 0-2% loans to homeowners to install solar hot water systems.⁵⁸⁷

The municipal utility in Bowling Green, Ohio, led a collaborative effort among ten municipal utilities to finance a wind-energy farm.⁵⁸⁸

Mason City, Iowa, changed zoning ordinances to allow appropriately sized wind turbines to be installed in residential zones.⁵⁸⁹

The city of Chicago and 47 other local government agencies formed the Local Government Power Alliance. Through it, they negotiated lower-cost electrical service that includes higher levels of renewable energy.⁵⁹⁰

For additional examples, see: **The Apollo Alliance, “New Energy for Cities—Energy Saving and Job Creation Policies for Local Government.”⁵⁹¹**

ICLEI, the International Council for Local Environmental Initiatives.⁵⁹²

The U.S. Department of Energy's Energy Efficiency and Renewable Energy home page.⁵⁹³

The National Renewable Energy Laboratory's home page.⁵⁹⁴

Sustainable Energy Investing

Energy is almost entirely produced and consumed by what accountants call “capital” goods—long-term investments in such energy producing devices as power plants, wind turbines, solar cells and the infrastructure like power lines to support them.⁵⁹⁵ Energy is usually consumed by other capital goods—the heating, cooling, and lighting systems in buildings, transit options like cars, and industrial equipment. Capital goods are meant to have a multi-year life, and are often paid for over the item's lifetime. Large energy producing or consuming systems are expected to last several decades.

Setting and delivering on short-term goals to replace wasteful, fossil fuel energy systems generates excitement, demonstrates commitment and builds institutional momentum towards sustainable strategies, but requires a plan to finance these alternative capital investments.

The success of renewable power efforts will be partly determined by whether such efforts are given consistent support by local and regional governments. Some local governments will be

⁵⁸³ Seattle City Light: www.seattle.gov/light/, 30 October 2006.

⁵⁸⁴ City of Seattle, www.seattle.gov/light/conserve/globalwarming/default.asp, 5 December 2006.

⁵⁸⁵ Apollo Alliance, “New Energy for Cities – Energy Saving and Job Creation Policies for Local Governments,” p.6, www.apolloalliance.org/docUploads/new%5Fenergy%5Fcities%2Epdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/SustainableEnergy/ApolloAlliance_EnergyforCities.pdf, 30 October 2006.

⁵⁸⁶ Ibid. p. 4.

⁵⁸⁷ Ibid. p. 5.

⁵⁸⁸ Ibid. p. 7.

⁵⁸⁹ Ibid. p. 7.

⁵⁹⁰ “Customer Aggregation: An Opportunity for Green Power?” by Edward Holt of Ed Holt & Associates, and Lori Bird of the National Renewable Energy Laboratory, 2001: www.eere.energy.gov/greenpower/resources/pdfs/lb29408.pdf, 30 October 2006.

⁵⁹¹ The Apollo Alliance, “New Energy for Cities – Energy Saving and Job Creation Policies for Local Government,” www.apolloalliance.org/ and www.apolloalliance.org/docUploads/new_energy_cities.pdf, 30 October 2006.

⁵⁹² ICLEI's web site: www.iclei.org, 30 October 2006.

⁵⁹³ The Department of Energy, www.eere.energy.gov/, 30 October 2006.

⁵⁹⁴ National Renewable Energy Laboratory, www.nrel.gov/, 30 October 2006.

hesitant to take on a leadership role if increased short-term costs threaten to temporarily dampen their business climate.

The solar energy industry in California hailed the California Solar Initiative because it created an 11-year certainty of support for the industry through rebates. This long-term approach will allow the industry to give investors a stable planning horizon that will give them the confidence to change from the business-as-usual course.

The city utility in Burlington, Vermont has invested heavily in renewable generation:

Over 46% of Burlington Electric Department (BED)'s power mix was from renewable sources in fiscal year 2005. This was up from 42% in 2004. BED is continuing to pursue additional renewable sources of power such as wind energy in an effort to add fuel diversity and to stabilize power costs for Burlington consumers. With fossil fuel prices at record highs, renewables act as a means to balance the high cost of fossil fuel based energy. The cost of generating renewable energy, especially in-state renewable energy, is level and generally predictable; unlike fossil fuel its price is not influenced by international

and market forces beyond our control and it does not contribute to global warming. We look forward to increasing Burlington's supply of renewables such as wind energy not only as a way of providing the citizens and business owners of Burlington with clean electricity but also providing them with an affordable and reliable supply. Renewable energy is part of a sustainable and fiscally sound power supply portfolio.⁵⁹⁶

The city of San Francisco boasts one of the nation's most comprehensive sustainable energy programs. It required the use of B20 biodiesel in all city diesel vehicles in 2006, moving to the use of B100 (100% biodiesel) in 2007. All city buildings must meet the U.S. Green Building Council's LEED Silver criteria for green buildings. The city passed a bond to fund putting solar electric systems on residential buildings, and will replace its payroll tax with a green tax credit for solar energy.

Community leaders need to realize that every day new capital investment decisions are made that will affect energy production and consumption patterns for decades to come. To minimize energy needs a community will need to invest in different

equipment choices that provides lasting value because it uses less energy. For example, investing in high performance green buildings that can be expected to be 50% less costly to operate is a good deal, even if there are higher initial design costs.⁵⁹⁷

Every time a community chooses inefficient options like centralized energy supplies, it locks citizens into years of being less competitive. It is important to articulate a sustainable energy future that looks two decades or so into the future, that maximizes your chances for widespread use of distributed, renewable energy, and that uses energy efficiently to help avoid long-term investments that will be uncompetitive or environmentally untenable in the future.

Primer on Sustainable Energy Sources

The primer below is offered as a guide. It obviously cannot address current or specific market conditions, since these are constantly changing. Renewable technologies are evolving rapidly as well. Every community should undertake an up-to-date investigation at the time of a sustainable energy planning process.

⁵⁹⁵ Former Oregon Governor John Kitzhaber, on launching a more sustainable energy future, said that "digging, drilling and burning" is a 19th century technology.

⁵⁹⁶ Burlington Electric Department Sources of Power, www.burlingtonelectric.com/sourcepower.htm, 30 October 2006.

⁵⁹⁷ The US Green Building Council has documented that good green buildings typically cost no more to build than ordinary, energy wasting structures. Even if there are an up-front costs, green buildings will typically result in a lifetime savings of up to 20% of total building cost. www.USGBC.org, 30 October 2006.

The following renewable energy sources will be explored further:

Wind-generated electricity;

Solar-generated electricity and hot water;

Biomass-generation;

Waste-generated electricity;

Hydro-generation;

Earth-generation;

Hydrogen power; and

Nuclear power.

Wind-Generated Electricity

Examples: Wind

- Horizontal-axis wind turbines (the most common type of turbine).
- Vertical-axis wind turbines (designed for capturing wind closer to the ground or tops of buildings).⁵⁹⁸
- Wind-capturing devices in the atmosphere e.g. floating wind turbines.⁵⁹⁹

Sustainability Attributes: Wind

- Wind energy can be used in a decentralized network but can also be used in a conventional grid system; wind has no ongoing emissions; requires minimal toxic or hazardous materials for construction and operations. Its costs are competitive to coal and natural gas, meaning that taking externalities into account, it may be several times less expensive than nuclear or fossil electricity that require ongoing fueling and avoidance of full-costs.

Sustainability Challenges: Wind

- Include potential wildlife impacts, other ecological impacts,⁶⁰⁰ visual impacts, maintenance challenges.⁶⁰¹

Market Challenges: Wind

- Include educating government leaders and customers about wind energy's potential, siting and regulatory challenges,⁶⁰² evolving technology, wind's intermittency, and challenges (given intermittency) in integrating with traditional electrical grid management.

Getting power lines built to accommodate intermittent wind resources is a challenge in the current structure of U.S. power grids.

Potential Community Support Actions: Wind

- Begin with giving priority to building wind energy infrastructure, and giving incentives to utilities and customers to buy wind and transition away from coal.

Solar-Generated Electricity and Hot Water

Examples: Solar

- Active or passive solar energy used to heat water, which may be used directly or used to heat buildings.
- Solar lighting design.
- Photovoltaics used to generate electricity directly from sunlight.

Sustainability Attributes: Solar

- Sunlight is the ultimate energy resource; it needs no fuel, in most parts of the world it is reliable (some of the largest recent solar photovoltaic installations are in cloudy Bavaria, Germany), and it is able to operate for long periods without maintenance, making it optimal for "off-the-grid" and dispersed applications.

⁵⁹⁸ Companies developing and marketing vertical axis wind turbines include Aerotecture International Inc., (Chicago, IL – see www.aerotecture.com) and Quiet Revolution Ltd., (UK – see www.quietrevolution.co.uk).

⁵⁹⁹ Such devices are held aloft in the atmosphere where wind speeds are higher by various means including balloons or virtual kites – for more see www.magenn.com, 30 October 2006.

⁶⁰⁰ For a summary of the current environmental challenges and solutions with offshore installations, see James O. Jones and Christine Love, "Bringing Offshore Wind Energy to Shore," *North American Windpower* magazine, October 2006, p. 16.

⁶⁰¹ Gearboxes have been a trouble spot for older wind turbines – given the expense of downtime and of gearbox repairs.

⁶⁰² Regarding offshore siting challenges, see John S. Hingtgen, "Shorelines Might Welcome Wind – From a Distance," *North American Windpower* magazine, October 2006, p. 25.

Sustainability Challenges: Solar

- Use of toxics in manufacturing; siting challenges; net energy contribution concerns.⁶⁰³

Market Challenges: Solar

- The cost (15+ cents per kilowatt hour for solar electricity) makes some solar options a difficult choice. More people will buy solar as the costs will decrease. About a dozen new companies promise to have competitive solar electricity within four years.

Potential Community Support Actions: Solar

- Homeowners and businesses have shown themselves to be enthusiastic buyers of solar when incentives are great enough to reduce up-front costs.

Biomass-Generated Electricity

Examples: Biomass

- Bio-gas (a substitute for natural gas or propane) generated from biomass. Biomass can either be specially grown or derived from waste streams—either prior to or after landfilling.

Agricultural biomass is used directly or for electrical generation.

- Wood-generated energy—wood-fired electrical power plants; direct burning of wood for electricity and/ or process heat; wood can also be converted to hydrogen fuel. Biofuels for vehicles and other users of portable liquid high-energy-density fuels, including ethanol and biodiesel from agricultural products, agricultural wastes and food wastes.

Sustainability Attributes: Biomass

- Biomass generated waste is carbon-neutral in that the biomass stored carbon during growth that is released during combustion (though not at the same rate).

Sustainability Challenges: Biomass

- Though technically carbon-neutral, biomass is nevertheless carbon-based and does not necessarily contribute to the dramatic reductions in carbon emissions needed for climate stabilization.⁶⁰⁴
- Market challenges include potentially fluctuating prices and supply.⁶⁰⁵
- Potential community support actions.

- Separate collection of biomass from other wastes.
- Incentives for use of local agricultural products or wastes in biofuel development, including public support of small business development to supply local wastes or other biofuels to processing plants and/or convert vehicles to better use biofuels.⁶⁰⁶
- Support (such as economic development tax or financial incentives) for pioneering biofuel retail outlets and/or distribution systems.

Waste-Generated Electricity

Examples: Waste

- Waste to energy systems – using landfill-destined materials to generate electricity and/or process heat.
- Waste biomass to energy (see biomass section).

Sustainability Attributes: Waste

- Can reduce impacts of waste hauling and management.
- Can reduce market and hauling/shipping challenges of recycling markets.
- Support local energy production enhancing energy security.

⁶⁰³ Author David Kimble found six studies of the energy returned for the energy input of existing solar PV electricity cells – the results ranged from .86 to 1.4 (1.4 means 40% more energy returned than invested). See www.energybulletin.net/14849.html, 30 October 2006. A solar installer in California states that in California, solar cells provide more energy than was required to make them after three years – see www.solarexpert.com/future2.html, 30 October 2006.

⁶⁰⁴ For more on this see US Department of Energy, “Our Changing Earth, Our Changing Climate – Biofuels: A Solution for Climate Change”, 1999, available at www.nrel.gov/docs/fy99osti/24052.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/SustainableEnergy/BiofuelsSolution.pdf, 30 October 2006.

⁶⁰⁵ Christopher Juniper of Natural Capitalism Solutions interview with Burlington VT’s municipal utility that operates a wood-fired power plant – wood cutters were leaving the market due to closure of paper mills, causing a shortage of wood for the power plant in 2004.

⁶⁰⁶ For example, a small Florida company has developed an efficient way to convert water into a clean burning fuel akin to hydrogen, and is developing auto conversion kits that boost gas mileage and use of cleaner fuels. See website of Hydrogen Technology Applications, Inc., www.hytechapps.com, 30 October 2006.

Sustainability Challenges: Waste

- Waste to energy plants can release toxics into the biosphere—the amount and type depending on the plant’s design and operation and the waste inputs.⁶⁰⁷
- Diverts waste to energy uses rather than reuse or recycling.

Market Challenges: Waste

- High infrastructure costs up front require dedication of waste streams to energy production rather than progressively more recycling.

Potential Community Support Actions: Waste

- Examine legislative definitions of toxic or hazardous waste to ensure they do not interfere with economical and sustainable recycling of such wastes through incineration or other energy-generating means.
- Ensure that landfill costs nearly always exceed the costs of recycling, reusing or incinerating wastes.⁶⁰⁸

Hydro-Generation Electricity

Examples: Hydro

- Freshwater storage power systems (dams).
- Wave-power electrical generation.

- Tidal-power electrical generation.

Sustainability Attributes: Hydro

- Essentially a solar-powered and infinite resource.
- Uses mechanical systems that require few toxic materials although coatings are likely toxic-based to withstand water damage.
- Operations have low ecological impact though are removing energy from an ecological system.

Sustainability Challenges: Hydro

- Power production not proximate to electrical demand—leading to materials and potential ecological damage from transmissions system installation and maintenance.
- Dams flood ecological systems and human land-uses (including villages/towns) and are difficult for migrating fish to navigate.

Market Challenges: Hydro

- A limited number of sustainable hydro opportunities
- Potentially long permitting processes—often for good reason since hydro can easily cause long-lasting damage to riverine ecosystems and

hydro sites are not often close to where the power will be consumed.

Potential Community Support Actions: Hydro

- Land use and permitting regulations that facilitate power generation at low-head or other hydro sites that are less ecologically destructive than big dam projects.

Earth-Generation

Examples: Earth

- Geo-thermal heat converted to steam and/or electricity.
- Earth-based heat pumps that more efficiently heat or cool buildings using the earth’s ambient temperature.
- Passive earth berming systems that moderate building temperature swings—reducing heating/cooling loads—including thick earth-based walls of buildings.

Sustainability Attributes: Earth

- Perhaps the least damaging to ecosystems, unless critical habitats or unique areas are damaged by the loss of heat to human uses.

⁶⁰⁷ Waste to energy plants are highly controversial – knowledgeable experts are not yet convinced that burning temperatures will *always* be high enough to break down all potential toxics prior to air emission. For more on this technology – see the Waste to Energy Research and Technology Council website at Columbia University www.seas.columbia.edu/earth/wter/, 30 October 2006. “Pollution from Waste-to-Energy Incinerators,” October 2006, at Alternative Energy website: www.alternative-energy-news.info/pollution-from-waste-to-energy-incinerators/, 30 October 2006.

⁶⁰⁸ This fundamental strategy is at the heart of highly successful waste reduction systems such as those of Portland, OR; Seattle, WA; and Alameda County, CA.

Sustainability Challenges: Earth

- Ecosystem damage from development and heat removal.

Market Challenges: Earth

- Relatively few sites available for active geothermal.
- Building codes can intentionally or accidentally interfere with innovative earth berming or heat pump systems.

Potential Community Support Actions: Earth

- Facilitate use of earth-based energy sources through friendly zone and development processes.
- Support studies and pilot projects demonstrating efficacy of new technologies.

A sustainable energy primer is not complete without briefly addressing the sustainable attributes of a promising new energy carrier, hydrogen, and the continued controversy regarding whether nuclear energy can be considered a sustainable technology for generating energy.

Hydrogen

Hydrogen, like electricity, is an energy carrier. Though a natural element, on earth hydrogen is bound with oxygen in the very strong bonds of water. To

“liberate” hydrogen takes energy. Once liberated, the hydrogen is attracted to rebond with oxygen to again form water. The flow of electrons generated by this process is the basis for the electricity produced by fuel cells.

Critical questions regarding whether and how the U.S. should adopt hydrogen as a preferred carrier of its energy future include:

Is hydrogen a more efficient carrier of energy than electricity—enough so to justify massive investments in hydrogen carrying infrastructure?

How easily can existing fleets be adapted to use hydrogen, if at all?

What storage technologies will emerge as the standards for the marketplace – facilitating investments in fueling infrastructure?⁶⁰⁹

Can fuel cells that convert hydrogen to electricity both come down in price and find alternatives to premium metals as the catalyst?

Auto companies expect technology debates regarding hydrogen vehicle technology to continue until about 2015. Meanwhile, the question for your community is whether there are cost-effective ways to support the development of a hydrogen

infrastructure as this technology develops.

Nuclear Power

Nuclear electricity can substitute for coal-fired generation as a utility baseload resource. Because the fissioning of nuclear material does not release GHG emissions (though the nuclear lifecycle releases large amounts), nuclear advocates claim that the technology is carbon neutral.

While some people are concerned enough about climate change to advocate using nuclear power as a coal substitute, most advocates do not consider nuclear to be a cost-effective substitute, a sustainable technology, or a viable solution. The first challenge with nuclear is its cost. New nuclear plants rival solar electric in price. Advocates claim that new varieties of reactors will be cheaper, but the past history of nuclear went, in the words of the Economist Magazine, “from too cheap to meter to too costly to matter.”⁶¹⁰ Nuclear technology is also strongly proliferative of nuclear bombs. Spreading the domestic power technology around the world would certainly encourage more nations to develop weapons capability.⁶¹¹

The multi-generation liability of toxic waste still plagues the nuclear fuel cycle, even after a half-century of determined research. A litmus test: would

⁶⁰⁹ Three distinct fuel systems continue to compete to become the preferred system for vehicles: pressurized hydrogen gas, hydrogen cooled to a liquid (becoming denser), and solid hydrogen fuel packs. For information on the latter, visit the website of Uni-Solar, which demonstrated solid hydrogen fuel packs in 2005: www.uni-solar.com, 30 October 2006.

⁶¹⁰ Economist magazine, August 27th, 2001.

⁶¹¹ Lovins, A, Lovins, H, *Energy/ War: Breaking the Nuclear Link*, Friends of the Earth 1980.

your community be willing to site a new nuclear plant or waste dump nearby? New reactor designs may hold promise of reducing the likelihood of catastrophic accidents, but such accidents are only the tip of the iceberg of the unsustainable aspects of nuclear power. Given that few communities would undertake to construct a reactor on their own, this debate is likely to be irrelevant to a community energy plan.⁶¹²

Primary Barriers to Address

There are hundreds of barriers that inhibit people from implementing energy systems that are preferable to what are in place now. The 1998 analysis of climate protecting opportunities, *Climate Making Sense and Making Money*⁶¹³ listed 60–80 specific market failures of 8 types:

1. Capital misallocation
2. Organizational failures
3. Informational failures
4. Regulatory failures
5. Value-chain risks
6. Perverse incentives
7. False or absent price signals
8. Absent markets

These include such market imperfections as:

Lack of clarity of benefits to local community

Lack of confidence in the numbers (payback, lifecycle costs) both with city departments and private businesses

Misalignment of the incentives that electric utilities see with the broader interests of the community

The lack of “communicators” who can help all stakeholders understand the benefits of renewable energy

Failure to acknowledge people’s perceptions of risks and how those risks can be mitigated, or how risk perceptions can be reduced

Conservatism of banks and hesitancy to deal with renewable energy investment/loan opportunities.

Some local municipalities have zoning rules against solar panels & wind turbines

Three barriers are particular challenges:

The hassle factor

Things are working fine, why change them? Margaret Mead said that the only person who likes change is a wet baby. The challenges posed by climate change will dictate change. Cities that undertake such programs on their own timeline will enjoy a significant advantage. But overcoming the basic hassle factor will take inspired leadership.

The complexity factor

Why should the city government get involved in a complex field full of experts at utility and energy service companies? As

this Manual has shown, utilities can be slow to move slowly towards a sustainable energy future for a variety of reasons, primarily including institutional momentum or skepticism, regulatory systems and their financial incentive structures. Utilities are critical economic development partners and can be encouraged to embrace the economic advantages of distributed and sustainable energy as part of rate-reduction strategy that will help your businesses become more globally competitive. Unless your utilities are taking a leadership role in sustainable energy, they will benefit from prompting – the nearly four-decade history of environmental activism with utilities demonstrates that not all the best ideas come from the “experts.” In short, the issues are complex but can be grasped by talented citizen’s committees for a sustainable energy future that will empower a community to take on matching production with end-uses, and maximizing the economic development benefits of keeping power generation dollars in the local economy.

The market challenges of distributed power (sustainable or not).

Distributed power generation located near the people who will use the power, and scaled to the size of consumption is a new concept for nearly all Americans. Key barriers to overcome through sustainable energy planning include:

⁶¹² For more on the challenges of nuclear see Nuclear Information and Resource Service www.nirs.org, 30 October 2006.

⁶¹³ For a systematic discussion of such barriers and how to clear them see Lovins, A, Lovins H, *Climate: Making Sense and Making Money*, 1998, www.natcapsolutions.org/publications_files/climate_sense.pdf, 30 October 2006.

Reluctance of citizens or organizations to enter the power production business themselves and/or make long term utility-type investments

Reluctance of financial institutions to fund utility-type investments at competitive interest rates – especially of new technologies with little collateral value

Lack of information flow to all but highly motivated citizens

All of these barriers can be reduced through visionary planning that helps the community understand that its energy future should be in its own hands; that the experts do not have all the answers; and that the energy security and other benefits of a more sustainable approach are serious economic development advantages.

Early sustainable power technologies systems gained a reputation, (deserved or not) for poor performance/ excessive maintenance, safety, cost, aesthetics and provider reliability/ stability.

Like most pioneering technologies, sustainable energy efforts have suffered from some ideas being ahead of available materials, design or maintenance capabilities. Too many people remain stuck in that past rather than observing the almost daily maturation of sustainable energy systems. Modern renewable

energy is a far cry from early systems. Public education is the remedy. Many communities sponsor sustainable living fairs or events that help citizens understand and welcome sustainable technologies.⁶¹⁴

Conclusion

Cities and regions can plan for a sustainable energy future: maximizing renewable energy sources; using market forces to balance energy prices through inclusion of externalities in energy prices; and supporting renewable investments through favorable regulations and financing.

While much research and experimentation to determine the right strategy for your community, a significant community of sustainable energy planning practitioners and proven practices is already available to guide the efforts of your community. Modern technologies to save energy and generate renewable energy communities can profitably protect the climate and the economy.

⁶¹⁴ A leading example is the annual Community Sustainability Conference and Expo produced with multiple community partners by Fort Carson Mountain Post of the US Army in the three county Pikes Peak region of south-central Colorado, sems.carson.army.mil, 30 October 2006. Numerous other conference formats have been developed – such conferences are also strong economic development opportunities.

Additional Resources

Race to the Top: The expanding role of U.S. State Renewable Portfolio Standards, Prepared for the Pew Center on Global Climate Change, June 2006, Author: *Barry G. Rabe, University of Michigan*

This report builds on earlier Pew Center analyses of the evolving state role in climate policy development, placing a particular focus on the RPS experience to date. It presents an overview of this policy tool and examines key factors in both policy formation and implementation. This work considers the experience of all RPS states but devotes particular attention to five case studies: Texas, Massachusetts, Pennsylvania, Nevada and Colorado that illustrate both common themes and points of divergence among individual state programs. The analysis concludes with an examination of RPS performance to date and some of the leading opportunities and challenges facing future development.

www.pewclimate.org/global-warming-in-depth/all-reports/race-to-the-top/index.cfm

American Energy Initiative Report

"The American Energy Initiative is a joint project of the Worldwatch Institute and the Center for American Progress focused on educating and

inspiring the public and policymakers on the importance of renewable energy to the economic, environmental and national security of the United States. The report, *American Energy: The Renewable Path to Energy Security*, demonstrates the potential of renewable energy and energy efficiency and presents a practical policy agenda for achieving them."

A copy of the report is available on the web at:
<http://americanenergynow.org/about/>

Funding Opportunity - U.S. Department of Energy Grant, Solar America Initiative (SAI) Market Transformation: Solar City Strategic Partnerships.

For incorporated cities with populations greater than 100,000. Application deadline: January 10, 2007
tinyurl.com/yyxja, 2 November, 2006

Prince Edward Island Renewable Portfolio—Prince Edward Island is planning to produce 30% of its total energy needs from local, renewable resources by 2016.

www.nawindpower.com/naw/print.php?plugin:content.175

BioTown, USA—this project's long term goal is to meet all the energy needs of Reynolds, Indiana via biorenewable resources, including electricity, natural gas replacement, and transportation fuel

<http://www.biotownusa.com/>



**NATURAL
CAPITALISM
SOLUTIONS**

NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548

Chapter 5: Develop a Local Action Plan

Long Term Initiatives

Education

DOCUMENT CONTENTS

Community Education Initiatives:	190
CASE STUDIES:	
Burlington, VT.....	191
Telluride, CO	192
SYNERGY, Actus	
Lend Lease	192
State of Maine	193
Albuquerque, NM.....	194
Additional Resources:	195

Education is one of the most important long-term initiatives that a city can use to address its greenhouse gas (GHG) emissions. Through education, a city gains greater engagement and support from the community to reduce carbon emissions. At the same time, education fosters critical thinking and nurtures the environmental leaders and experts of the future.

There is no right way a city should go about creating an education initiative, but many cities are trying different programs with great success. A few will be highlighted in case studies below. The most important thing to remember is that in order to create a successful education initiative, people must be interested, engaged and feel that they can take steps in their own lives to make a difference.

Community Education Initiatives

Initiatives to educate communities on climate change and GHG reduction include:

School Initiatives

Create a challenge for local schools to meet, such as reducing their school's energy use or reducing waste. Give the winning school or class a prize (such as a field trip, school event, award or prize related to reducing emissions). Some schools have offered faculty and students a share of the savings they achieved by shutting off unneeded lights and otherwise reducing energy waste. They have often been surprised by the size of the resulting savings. Similar programs can be offered to the facilities staff. Resulting awards can be used to increase staff salaries, hold a party or buy needed equipment for programs. Or even better, the savings can go into a fund to capitalize further savings.

School Curriculum

Develop a curriculum for schools focused on a specific grade, specific class or a course section for all grades. The curriculum can be either optional or mandatory. Focus on making the curriculum engaging and interactive.⁶¹⁵ The electric utility BC Hydro worked with schools in the Vancouver area to create a software program that students could use in their school to identify and capture energy savings, and another that they could take home to do an audit of their own houses.

Community Emissions Reduction Challenges

Create a community-wide goal. For example, Burlington, Vermont challenged the community to reduce carbon emissions 10% by 2010. Provide incentives, education and resources for participants. The more people know about the climate reduction program, the greater its likely success.

Distribute Educational Materials

Make educational materials widely accessible and engaging to all ages and groups. Service clubs, the Chamber of Commerce, Boy and Girl Scouts

Museum and Science Centers

Encourage local museums and science centers to include interactive, hand-on displays on climate change and its relation to energy use. Encourage and provide incentives to local schools to take students to visit.⁶¹⁶

Engage Community Stakeholders

Successful education programs incorporate local groups, experts and activists in all stages of the planning and implementation processes. Refer to Chapter 5, Stakeholder Engagement section for more information and resources.

Community Education

CASE STUDY: Burlington, VT

In May of 2000, the City Council of Burlington adopted a Climate Action Plan aimed at reversing the steady growth of GHG emissions in the city of Burlington. In April of 2002, the 10% Challenge program was launched as a joint effort between the Mayor's task force and community leaders. The goal of the program was to encourage individuals, households and businesses to reduce GHG emissions and to educate communities in and around Vermont on the threat of global climate change to the environment and the economy. The program's goal is to reduce GHG emissions by 10% below 1997 emissions levels by 2010.⁶¹⁷

Since the program's launch, 93 businesses and 1,200 residences have begun to reduce their global warming pollution. Many cities near Burlington have also joined the 10% Challenge. Employees in municipalities are encouraged to create energy saving initiatives such as making thoughtful decisions regarding consumption of office products, turning office equipment on to "sleep" mode when not in use, purchasing Energy Star equipment and buying office supplies in bulk whenever possible.⁶¹⁸

The 10% Challenge provides the tools and the information people need to conserve energy at home and at work.

An online emissions calculator helps businesses and residence calculate their current annual greenhouse gas emissions and their target emissions. Resources on the website give participants ideas on how they can meet their goals. The program also provides incentives and awards for participants who meet their 10% goal.

CONTACT

Deb Sachs
(802) 865-7330
dsachs@10percentchallenge.org

Elaine Wang
(802) 865-7375
ewang@10percentchallenge.org

⁶¹⁵ For ideas on school curriculum see resources at end of this document.

⁶¹⁶ For more information and ideas for museum and science center displays see, globalwarmingcalifornia.net/museums.htm, 5 October 2006.

⁶¹⁷ Clean Air—Cool Planet, www.cleanair-coolplanet.org/for_communities/behavior_change.php, 29 September, 2006.

⁶¹⁸ The 10% Challenge. www.10percentchallenge.org/, 5 October 2006.

CASE STUDY: Telluride, CO

The Town of Telluride, Colorado launched the “Telluride Unplugged” Initiative in 2006. Telluride Unplugged was a 6-week campaign focused on educating and engaging the public about what they can do to reduce carbon emissions. As a signer of the U.S. Mayor’s Climate Protection Agreement, Telluride’s initiative is part of its effort to reduce GHG emissions 7% by 2012.⁶¹⁹

Each week of the event focuses on a different area, with themes

ranging from energy efficient lighting to food to transportation.

The first week’s introduction began with a free screening of Al Gore’s “An Inconvenient Truth” and a call for residents to calculate their carbon footprint to provide each person with a baseline for setting individual reduction goals. Carbon footprint calculation worksheets were made available at the public library, town hall and the local farmer’s market, as well as online.

According to Karen Guglielmon, a Telluride public works official, “Telluride Unplugged is the beginning of Telluride government trying to engage the broader community in its efforts to reduce our carbon footprint.”⁶²⁰

CONTACT

Project Manager
Karen Guglielmon
(970) 728-3071
Karen@telluride-co.gov

CASE STUDY: SYNERGY, Actus Lend Lease

SYNERGY, which stands for Saving Your Nation’s Energy, is an Actus Lend Lease⁶²¹ program that strives to reduce energy consumption through community-based education efforts, portfolio-wide technological solutions and symbiotic partnerships with our stakeholders. SYNERGY is the only program in the real estate industry to take this kind of comprehensive approach to the reduction of energy usage—with a focus on both building efficiency and behavioral modification.

SYNERGY has helped residents, businesses and organizations throughout the country make substantial savings in energy use.

At Fort Campbell (Kentucky) and Fort Hood (Texas), SYNERGY has assisted in reducing energy consumption by as much as 12% over the same month the prior year. At Fort Drum (New York), electricity costs plummeted \$13,000 (or 14%) from May 2006 to June 2006 as SYNERGY community programs and

educational efforts got underway.⁶²²

Sample efforts include:

Distributing and reviewing conservation tips with all new residents

Making all resident activities “green” (see the EPA’s Guide to Green Events)
Financially rewarding consumption below the DOE’s normalized baseline

⁶¹⁹ Town of Telluride, www.town.telluride.co.us/home/index.asp?page=2, 5 October 2006.

⁶²⁰ Katie Klingsporn, “Town Launches Unplugged Campaign.” Telluride Daily Planet, Oct. 1, 2006. www.telluridegateway.com/articles/2006/10/02/news/news01.txt, 5 October 2006.

⁶²¹ Actus Lend Lease, www.actuslendlease.com/, 5 October 2006.

⁶²² Full Case Study archived, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/Education/ActusLendLease_Synergy.pdf, 5 October 2006.

Providing children’s activity books, complete with energy conservation checklists and prizes for completion

Partnering with national zoo educational staff to use characters in activity books that promote endangered

species awareness and protection

Providing free technology, like COSMEO from Discovery Learning, to residents to test energy management behavior modification

CONTACT

Sustainability and Innovation
Coordinator—Actus Lend Lease
Tabitha Crawford
(615) 324-7545
TCrawford@ActusLendLease.com

Community Education

CASE STUDY: State of Maine

The Maine Energy Education Program (MEEP)⁶²³ is a non-profit organization begun in 1985 with the goal of helping citizens understand energy concepts so that they will be capable of making informed energy decisions. MEEP has developed various free projects and workshops for 4th through 12th grade teachers to implement in the classroom. MEEP’s Green Schools Program gives students the chance to monitor the energy use of their school. Classrooms are given incentives to win energy challenges and to save their school’s energy and money.

For example, in the Vending Mi\$er Challenge, classes are lent a “Vending Miser” which saves energy by cycling down vending machines compressor when it is not in use. The class monitors the amount of energy used by the vending machine without the miser and with the miser and then calculates the energy savings (usually around 50%). If the class presents their findings to the administration or facilities, MEEP will donate a Vending Miser to the school.

Another one of MEEP’s most popular projects is the Model

Solar Car Competition where students actually build their own solar cars and then race them in a competition. As of 2006, eight to ten communities in Maine are involved in MEEP.

CONTACT

MEEP Director
Peter Zack, Jr.
(207) 625-7833
MEEP@PSouth.net

MEEP Energy Educator
Jeremy Dubois
(207) 287-4855
Jeremy.R.Dubois@maine.gov

⁶²³ MEEP Homepage, www.mEEPnews.org, 5 October 2006.

CASE STUDY: Albuquerque, NM

Albuquerque's education for a sustainable community⁶²⁴ was a concept developed in 1975 due to growing concern over the city's explosive growth and the effects such expansion could have on the quality and supply of water, open space, waste disposal community as well as by schools. The hands-on interpretive approach of the book is designed systems, the built environment and the general quality of life.

The city of Albuquerque, Albuquerque Public Schools and local volunteers produced a teacher's resource book on environmental education. The final product, *Albuquerque's Environmental Story* (AES), was first printed in 1978.

AES quickly became more than a teachers' resource book, and served as a basis for a unique

environmental education program for use by the general adult to heighten readers' awareness, enhance their capacity to enjoy the beauty surrounding them and to develop a sense of social and environmental stewardship in readers. AES is interdisciplinary and stresses critical thinking. It is structured to add relevance to and augment the teaching of basic skills for young students.

The authors deal with the basic problem of adding environmental education to an already crowded curriculum by making it possible to infuse these materials easily into the existing required curriculum. Educators who have used the book have found this to be an approach that promotes awareness, knowledge, valuing and responsibility, while making the prescribed curriculum more interesting.

The second and third editions of AES were published in 1985 and 1996. Even though there are no newer published editions, the online version is frequently updated and many local schools still use AES as a part of their curriculum. In addition, the AES has served as a model for many other cities and has been replicated with success in southern Florida in *The Dade County Environmental Story* and *The Florida Key's Environmental Story*. Albuquerque's website provides information on how to replicate a resource book in your community and allows you to view the text of *Albuquerque's Environmental Story*.⁶²⁵

CONTACT

Information System's Manager
Dan Jones
(505) 768-2955
djones@cabq.gov

⁶²⁴ Albuquerque's Environmental Story, www.cabq.gov/aes/index.html, 5 October 2006.

⁶²⁵ How to Create your own Community's Environmental Story, www.cabq.gov/aes/process/index.html, 5 October 2006.

Additional Resources

School Initiatives and Curriculum:

- California Climate Change and Energy, Education Resources Catalog globalwarmingcalifornia.net/k12.htm
- Clean Air Kids www.clean-air-kids.org.uk/information.html
- Climate Change Education.Org. Website dedicated to education on global warming and climate change. Offers science, solutions, curriculum and resource directory www.climatechangeeducation.org

Hike & Bike Challenge

www.environmentalsociety.ca/hikebike/how-to.html

The Sierra Club has released a guide, “Cool Cities: Solving Global Warming One City at a Time.” The guide explains the steps toward making cities “cool” and tells success stories from a broad range of cities, from greening municipal vehicle fleets with hybrid cars in Houston and Charlotte; energy efficient street lights and buildings in Salt Lake City and Scottsdale, Arizona; to renewable energy investments in Waverly, Iowa and Columbia, Missouri. The guide is available online at www.sierraclub.org/globalwarming/coolcities.

Maine Energy Education Program

home.psouth.net/~meep/

Community-Based Projects to Help Reduce Greenhouse Gas Emissions

www.mb.ec.gc.ca/info/news/cc01s43.en.html
www.on.ec.gc.ca/announce.cfm?ID=679&Lang=e

Texas State Energy Conservation Office, Energy Education Links

www.seco.cpa.state.tx.us/sch-gov_ed-links.htm

Museum and Science Center Resources:

Marian Koshland Science Museum, Washington, D.C.
www.koshland-science-museum.org/exhibitgcc/index.jsp

Alliance to Save Energy, Green Schools Program

www.ase.org/section/program/greenschl

Students Leading the Way 2004-2005: Energy Saving Success Stories from California's Schools

www.ase.org/images/lib/educators/Success%20Book%2005.pdf.

Also archived:

www.natcapsolutions.org/ClimateManual/Cities/Chapter5/LongTermInitiatives/Education/CASchools_energysavings.pdf, 5 October 2006

Science Museum of Virginia

virginia.science.museum/Education/MiniMarine.html

The Colorado Energy Science Center School Program teaches students about the sources of energy and the economics and environmental issues associated with energy use. For the 2006-2007 school year, CESC offers the following programs to students, teachers and schools:

- Energy Hog Traveling Road Show—interactive school assembly program that teaches 3rd-6th grade students about the sources of energy, how we waste energy and how to conserve energy www.energyscience.org/education/EnergyHog/index1.htm
- Energy Science in the Home: Hands-on Activities for the Middle Grades—inquiry-based program that helps students explore the dynamics of home energy use through investigations that integrate math, science and economics
- Home Energy Investigation Contest event for middle and high school students which is a project-based learning experience to investigate home energy use; home energy efficiency, and; improvements in home energy efficiency www.energyscience.org/education/homeenergy/index.html
- Special Projects for 2006-2007 www.energyscience.org/education/Special.Projects.html
- www.energyscience.org/education/index.html

NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION

WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025

INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548

Chapter 5: Develop a Local Action Plan Long Term Initiatives Waste Management

DOCUMENT CONTENTS

Strategies for Municipal Solid Waste Management	197
Source Reduction	197
Recycling/ Composting	197
Recycling	198
Composting	198
Incineration/ Combustion	199
Landfill	200
CASE STUDIES:	
Rapid City, SD	201
Northwest Indiana	201
Palo Alto, CA	202
San Jose, CA	203
Tools for Community Waste Prevention	203
Additional Resources	206

This process of generating garbage and what becomes of it when it is thrown away produces greenhouse gases (GHGs) in a variety of ways. There is an enormous amount that a community can do to reduce the waste that it produces. Helping citizens reduce waste is part of a program to protect the climate.

In 2003 the U.S produced more than 236 million tons of Municipal Solid Waste (MSW), or trash. This is equal to approximately 4.5 pounds of waste per person per day.⁶²⁶ The sources of waste generation break down as follows⁶²⁷:

- Paper: 35.2%
- Yard Trimmings: 12.1%
- Food Scraps: 11.7%
- Plastics: 11.3%
- Metals: 8.0%
- Rubber, Leather, and Textiles: 7.4%
- Glass: 5.3%
- Wood: 5.8%
- Other: 3.4%

The United States Environmental Protection Agency (EPA) website explains:

The anaerobic decomposition of waste in landfills produces methane.

The incineration of waste produces CO₂ as a by-product.

The transportation of waste to disposal sites produces GHGs from the equipment's fuel combustion.

***The disposal of materials indicates that new products are being produced as replacements; this production often requires the use of fossil fuels to obtain raw materials and manufacture the items.*⁶²⁸**

EPA describes four main stages of product life-cycle (raw material acquisition, manufacturing, recycling, and waste management) and illustrates how they connect with GHG emissions. Similarly,

⁶²⁶ If all forms of the materials flow required to produce what Americans use are counted, including all of the water, gasses and mine tailings, it amounts to 20 times your body weight for every American every day. Yet of all of this stuff, less than 1% is ever embodied in a product and is still there six months after sales. All the rest is waste. For more information on the staggering amounts that we waste, see Hawken, Lovins and Lovins, *Natural Capitalism*, P52, Little Brown, 1999.

⁶²⁷ These are 2003 numbers courtesy of EPA Municipal Solid Waste Facts www.epa.gov/msw/facts.htm, 30 September 2006.

⁶²⁸ U.S. EPA Global Warming, yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsWasteBasicInfoGeneral.html, 5 October 2006.

reducing this waste (through source reduction, recycling and composting) can reduce the methane emitted from landfills,

GHG emissions from incinerators, and carbon dioxide emitted from energy consumption. Using fewer wood

and paper products decreases deforestation and can result in increased capacity of forests to sequester carbon.⁶²⁹

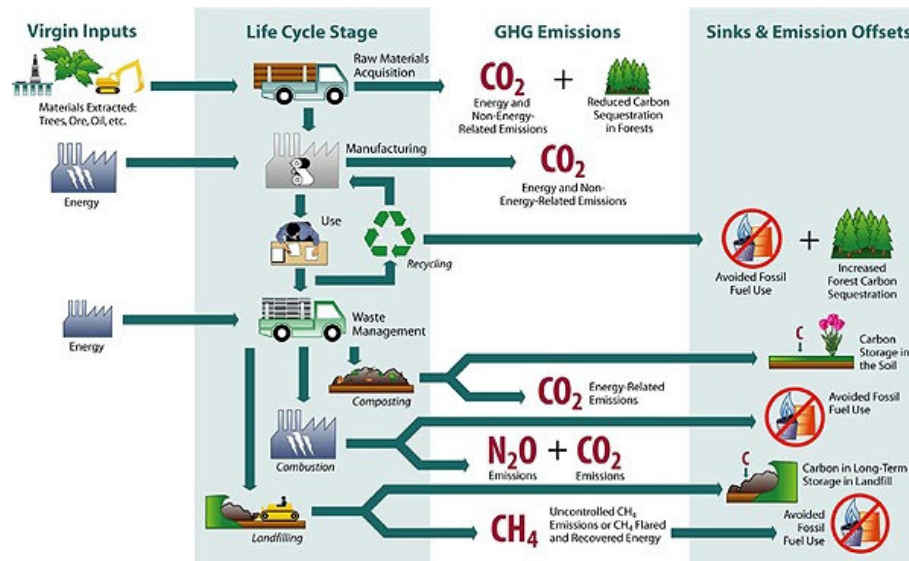


Figure: United States Environmental Protection Agency⁶³⁰

Strategies for Municipal Solid Waste Management

There are several management strategies for cities to consider in reducing their waste generation.⁶³¹

Source Reduction

Recycling/ Composting

Incineration/ Combustion

Landfill

Source Reduction

Source reduction is a management strategy to reduce

the amount of waste generated from the beginning. These initiatives include altering the design, manufacture and use of materials to decrease the amount of materials that are sent to the landfill. Although cities cannot dictate these practices throughout the community, there are ways to educate businesses and residents to enable them to institute practices that eliminate waste before it is created. One approach is to implement environmental purchasing policies. These policies and practices for municipal operations are described in the Best Bets Section of Chapter 5. Cities can also encourage local businesses to create products in more environmentally friendly

ways. Approaches like Design for Environment, and lean manufacturing are gaining in popularity, in part because they reduce the cost of producing goods.⁶³²

Recycling/ Composting

Much of the focus of MSW management is on diverting waste that is sent to the landfill after it has already been created or disposed of. According to the EPA, recycling and composting diverted 72 million tons of material away from disposal in 2003 - up from 15 million tons in 1980, when the recycle rate was just 10% and 90% of MSW was being landfilled.

⁶²⁹ U.S. EPA, yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsWasteBasicInfoGeneral.html, 6 October 2006.

⁶³⁰ U.S. EPA, yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsWasteBasicInfoGeneralLifeCycle.html, 6 October 2006.

⁶³¹ EPA Municipal Solid Waste Facts www.epa.gov/msw/facts.htm, 30 September 2006.

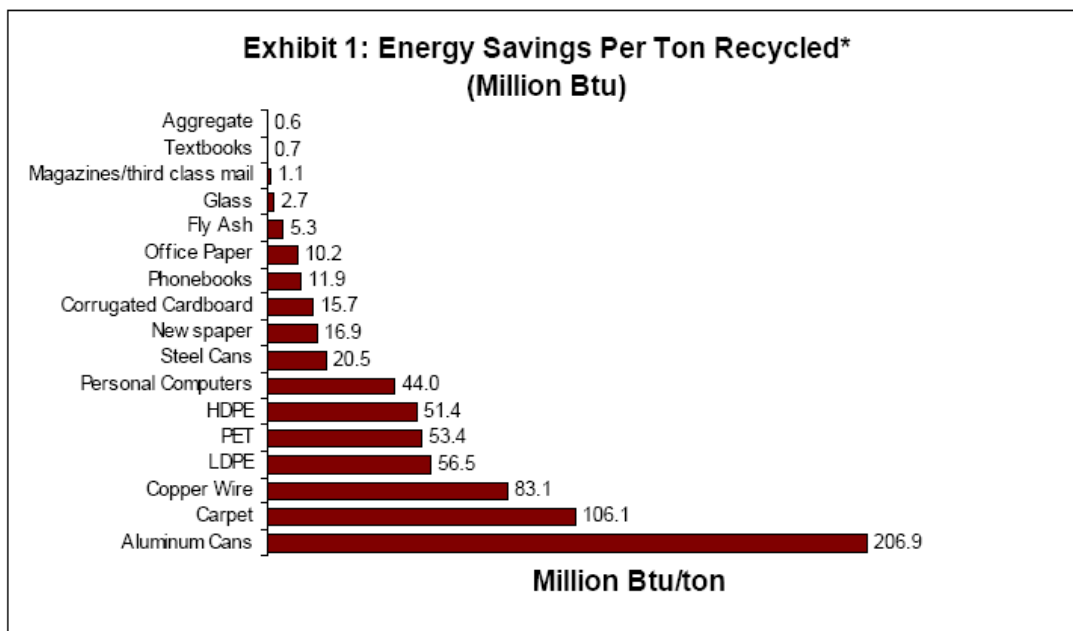
⁶³² For more information on Design for Environment see: www.epa.gov/dfe/. For more information on lean manufacturing see: www.sme.org/leandirections and www.isixsigma.com/me/lean_manufacturing/, 15 January 2007.

Recycling

Materials that are recycled include batteries, recycled at a rate of 93%, paper and paperboard at 48%, and yard trimmings at 56%. Some cities provide curbside recycling

programs drop-off centers, buy-back programs and deposit systems.⁶³³ Recycling reduces GHG emissions at two levels: emissions from landfill or incineration and emissions saved from avoiding further need for

the virgin material. Energy savings that can be achieved from recycling depend in part on energy intensity of virgin versus recycled material, but range as illustrated by the table below.



* Assumes recycled materials would otherwise have been landfilled. Includes embedded energy.

Table: EPA Waste Management and Energy Savings: Benefits by the Numbers⁶³⁴

Composting

Composting is the process of diverting organic waste from the landfill, enabling it to be converted to a soil amendment and using it as fertilizer. Not only does this keep the material from rotting in the landfill and releasing methane, but it reintroduces the carbon to the soil where it can be held for years. Since 1997 the city of

Clifton, New Jersey has been actively engaged in educating citizens about waste reduction and climate change. As part of this, the city promotes backyard composting and leaving grass clippings on the lawn. An education campaign explains that, “for every 7.4 tons of materials the city composts, it decreases greenhouse gas emissions by an amount equal to

the annual emissions of one car.” Due to composting grass and food waste, the city estimates citizens have reduced GHG emissions equivalent to 582 cars’ annual emissions.⁶³⁵

Yard trimmings and food residuals together constitute 23% of the U.S. municipal solid waste stream.⁶³⁶ Compostable material includes⁶³⁷:

⁶³³ Ibid.

⁶³⁴ Choate, A., Pederson, L., Scharfenberg, J. (ICF Consulting) & Ferland, H. (U.S. Environmental Protection Agency). “Waste Management and Energy Savings: Benefits by the Numbers.”

[yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/TMAL6GDR3K/\\$File/Energy%20Savings.pdf](http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/TMAL6GDR3K/$File/Energy%20Savings.pdf), 6 October 2006.

⁶³⁵ “City of Clifton: Education is Key to Reducing Climate Change”

www.epa.gov/wastewise/pubs/clifton.pdf#search=%22climate%20change%20composting%22, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/WasteManagement/Clifton_WasteWise.pdf, 19 October 2006.

⁶³⁶ EPA Composting website, www.epa.gov/epaoswer/non-hw/composting/index.htm, 4 October 2006.

⁶³⁷ EPA Composting website, www.epa.gov/epaoswer/non-hw/composting/basic.htm, 4 October 2006.

- Animal manure
- Cardboard rolls
- Clean paper
- Coffee grounds and filters
- Cotton rags
- Dryer and vacuum cleaner lint
- Eggshells
- Fireplace ashes
- Fruits and vegetables
- Grass clippings
- Hair and fur
- Hay and straw
- Houseplants
- Leaves
- Nut shells
- Sawdust
- Shredded newspaper
- Tea bags
- Wood chips
- Wool rags
- Yard trimmings

Compost programs can be carried out differently depending upon the cities' needs. Common composting methods include source separation of organic compostables done by residents or businesses and separation of mixed waste streams at a centralized location. Major concerns in any composting program include the quality of the compost produced, the cost, and residential involvement.

According to Cornell Waste Management Institute Fact Sheets on Composting:

There are several trade-offs between source separation and centralized separation of compostables. It is clear that source separation can produce

a higher quality, less contaminated compost, as well as maximize the recycling of glass and paper. And while source separation is generally less convenient for the waste generator, pilot programs are finding that many generators like to do it. However, two other important factors, the overall system cost and the quantities of materials recovered for recycling and composting, have not yet been adequately researched or evaluated.⁶³⁸

Although it is generally believed that mixed waste collection leads to increased participation, the results are not conclusive. A few pilot studies have shown that programs requiring separated compostables can have high participation rates as well. For example, projections for materials diverted from landfills for separated streams usually range from 25-50%. Fillmore County in Minnesota has exceeded these projections with 50% compostable diversion rate with an additional 15-20% for recycled material.⁶³⁹

Obtaining residential and business involvement is clearly important to maximize the success of composting programs. To educate and encourage participation, the city of Santa Clara offers a master composter training course. The program started in 1995 to educate residents in starting and

maintaining home compost. Upon completing the program, master composters are required to volunteer 50 hours to conduct composting workshops and educational outreach in their community. In the past 10 years, the program has trained 275 people, who have collectively donated over 24,000 hours of volunteer time.⁶⁴⁰

Incineration/ Combustion

According to EPA, "To reduce waste volume, local governments or private operators can implement a controlled burning process called combustion or incineration. In addition to reducing volume, combustors, when properly equipped, can convert water into steam to fuel heating systems or generate electricity. Materials can be removed for recycling prior to incineration facilities."⁶⁴¹

Burning MSW can generate energy while reducing the amount of waste by up to 90% in volume and 75% in weight. In 2001, there were 97 combustors in the United States with energy recovery with the capacity to burn up to 95,000 tons of MSW per day.

While scrubbers and filters can reduce pollutants emitted into the air, incineration still produces carbon dioxide as a by-product, as well as other harmful emissions.

⁶³⁸ Tom Richard, Municipal Solid Waste Composting Fact Sheet, Cornell Waste Management Institute, compost.css.cornell.edu/MSWFactSheets/msw.fs1.html, 4 October 2006.

⁶³⁹ Tom Richard, Municipal Solid Waste Composting Fact Sheet, Cornell Waste Management Institute, compost.css.cornell.edu/MSWFactSheets/msw.fs3.html, 4 October 2006.

⁶⁴⁰ Santa Clara County Composting, www.sccgov.org/portal/site/iwm/menuitem.244564f66e6d425580b558bb35cda429/?path=%2Fv7%2FIntegrated%20Waste%20Management%20%28DIV%29%2FHome%20Composting, 4 October 2006.

⁶⁴¹ EPA Waste, www.epa.gov/epaoswer/non-hw/muncpl/landfill/sw_combst.htm, 5 October 2006.

Environmental impacts of MSW-fired power generation plants include:

- Air emission impacts⁶⁴²
- Water Resources
- Water Discharge
- Solid Waste
- Land Use Resources

Types of incinerators include:⁶⁴³

Modular incinerators, which burn 15-100 tons per day, are small mass burn plants. The main advantage to this system is flexibility - if more capacity is needed, more units can be added onto existing ones. Costs limit the use of this technology because the payback in terms of energy produced over time is much lower than in mass burn plants.

Mass Burning Systems, which burn 200-750 tons per day per unit. The resulting steam can be used for industrial uses or generating electricity. These can combust without any preprocessing or separation, although most mass burn plants can remove non-combustible steel and iron for recycling before combustion using magnetic separation processes. Other non-ferrous metals can be recovered from the leftover ash.

Refuse-derived fuel systems process solid waste before it is burned. A typical plant will remove non-combustible items, such as glass, metals and other recyclable materials. The remaining solid waste is then shredded into smaller pieces for burning. RDF plants require significantly more sorting and handling than mass burn, but can recover recyclables and remove potentially environmentally harmful materials prior to combustion. RDF can be burned in power boilers at factories or even at large housing complexes.

Landfill

The number of landfills in the United States is steadily decreasing—from 8,000 in 1988 to 1,767 in 2002. The capacity, however, has remained relatively constant. New landfills are much larger than in the past.⁶⁴⁴

According to the EPA, MSW landfills are the largest source of human-related methane emissions in the United States, accounting for about 25% of these emissions in 2004. These methane emissions from landfills represent a lost opportunity to

capture and use a significant energy resource. Landfill gas (LFG) is created as organic solid waste decomposes in a landfill. This gas consists of about 50% methane (CH₄), the primary component of natural gas, about 50% carbon dioxide (CO₂), and a small amount of non-methane organic compounds.^{645 646 647}

Projects to capture and use landfill gas are explained and examples provided in Chapter 5, Best Bets, Municipal Infrastructure Section.

⁶⁴² The average air emission rates in the United States from municipal solid waste-fired generation are: 2988 lbs/MWh of CO₂, (it is estimated that the fossil fuel-derived portion of carbon dioxide emissions represent approximately one-third of the total carbon emissions) 0.8 lbs/MWh of sulfur dioxide, and 5.4 lbs/MWh of nitrogen oxides. U.S. EPA, *Compilation of Air Pollutant Emission Factors (AP-42)*, taken from the www.epa.gov/ttn/chief/ap42/, 15 October 2006.

⁶⁴³ Keep America Beautiful, www.kab.org/partners.asp?id=538&rid=539#MB, 15 October 2006.

⁶⁴⁴ To learn more about methane emissions from landfills in the U.S., visit EPA's methane emissions and sources page, www.epa.gov/methane/sources.html, 4 October 2006.

⁶⁴⁵ EPA Methane, www.epa.gov/methane/sources.html, 4 October 2006.

⁶⁴⁶ For more information on methane emissions from landfills internationally, visit EPA's International Analyses, www.epa.gov/nonco2/econ-inv/international.html, 4 October 2006.

⁶⁴⁷ EPA LMOP, www.epa.gov/outreach/lmop/overview.htm, 4 October 2006.

CASE STUDY: Rapid City, SD

With the realization that their landfills were quickly filling Rapid City, South Dakota, initiated an aggressive composting and recycling programs. A Solid Waste Plan was first passed by the City Council in 1992, but it was not until 2003 that the plan became fully operational.⁶⁴⁸

According to Barbara Petroff, project manager for USFilter's IPS Composting System, which was used in the facility, these efforts will extend the life of the landfill by 30 years and enable the city to avoid the purchase of over 1,000 additional acres.

The system composts wastewater biosolids, food, paper, yard waste and other organic residuals and is designed to convert 213 tons of waste into compost per day. A chemical scrubber and biofilter treat the processed air generated at the composting building to remove odors. The city sells the compost for use in golf courses, nursery potting soil, reclaiming land and other applications, for about \$20-30 yard. These sales help pay for operating the compost facility,

which uses no tax dollars to maintain operations.⁶⁴⁹

CONTACT

Jerry Wright
Public Works Department
Rapid City, SD
(605) 355-3496
jerry.wright@rcgov.org

Barbara Petroff
US Filter IPS Composting System
(508) 347-7344
www.usfilter.com

CASE STUDY: Northwest Indiana

In 2004, the Northwest Indiana Solid Waste District Board⁶⁵⁰ began offering education grants for schools in the six-county district. The funds are available for schools to support waste reduction education and recycling. \$30,000 is appropriated each year with each county receiving up to \$5,000. This augments funding the district has had available for cities and towns since 1997.

Each year, the District Board allocates \$120,000 for the Cities and Towns Grant Program to implement or expand waste management programs that coincide with the District's objectives for waste reduction.⁶⁵¹ The purpose of the grant is to support integrated waste management programs around source reduction, recycling, composting and education. \$20,000 is allotted for division among the successful applicants

from each county. Cities and towns must match grants given by the board by 25%; however, education grants given to schools do not have a matching requirement.

The Board is involved in outreach and education projects throughout the district. Funding for the Board and for grants comes from landfill tipping fees collected in the district. The District encourages creativity and

⁶⁴⁸ Rapid City Solid Waste Operations, www.rcgov.com/pubworks/solidwaste/04_solidwaste_report.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/WasteManagement/RapidCity_solidwaste_report.pdf, 19 October 2006.

⁶⁴⁹ Turning Cash into Trash, www.dnrec.delaware.gov/NR/rdonlyres/BB472D80-ECCC-4397-9EAF-B7BE6A544A9E/63/RapidCitySDTurningTrashIntoCashcomposting.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/WasteManagement/RapidCity_TurningTrashIntoCash.pdf, 4 October 2006.

⁶⁵⁰ Northwest Indiana Solid Waste District, www.nwiswd.org, 5 October 2006.

⁶⁵¹ Northwest Indiana Solid Waste District Grants, www.nwiswd.org/grants/citiesandtowns.pdf#search=%22cities%20waste%20reduction%20goals%22, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/WasteManagement/NorthwestIndiana_grants.pdf, 4 October 2006.

unique planning for projects. A short list of some suggestions is provided here:

Starting a curbside recycling program—purchasing bins and promotion

Starting a drop-off recycling program—purchasing equipment and promotion

Starting a yardwaste collection program—purchasing equipment and promotion

Starting a backyard composting program—organizing a sale of bins and education

Equipment purchases—to expand current recycling or waste reduction programs

Market enhancement activities—organizing events to promote recycled items

Educational or promotional activities—fairs, festivals, etc.

Buying recycled products—large items for public places to promote recycled items

CONTACT

Director
Carol Stradling
Northwest Indiana Solid Waste
(574) 583-5976
info@nwiswd.org

Municipal Solid Waste Management

CASE STUDY: Palo Alto, CA

The city of Palo Alto, California adopted a Zero Waste Resolution in 2005. The goal is to divert 73% of their waste by 2011 and 100% by 2021.⁶⁵² The Council also adopted the Zero Waste Strategic Plan as guidance for city staff to achieve the goals.⁶⁵³

In 2003, the total tons generated were 166,548. The current city diversion rate of 57% equals about 95,000 tons per year. To achieve its goals for 73% diversion by 2011 as part of a Zero Waste Strategic Plan, the city needs to divert an additional 26,000 tons per year of materials.

Current processing, transfer and disposal costs are about \$82.50/ton. On that basis, the avoided costs of processing, transfer and disposal for this additional 26,000 tons would be approximately \$2.1 million/year.

Based on assumptions detailed in its strategic management plan, the city estimates that diverting this amount will result in an overall savings of over \$800,000 per year.

The Strategic Management Plan suggests city programs, policies, rates, and financial and contractual commitments should be adjusted to help achieve the Zero Waste goal as follows:

Encourage All Sectors to Implement Zero Waste.

Develop Infrastructure Beyond Recycling.

Lead by Example and Advocate Zero Waste.

Update Waste Data and Develop Zero Waste Operational Plan.

CONTACT

Russell Reiserer
Solid Waste Manager
(650) 496-5910
zerowaste@cityofpaloalto.org

⁶⁵² Palo Alto Zero Waste Resolution, www.city.palo-alto.ca.us/zerowaste/documents/zw-Palo_Alto_ZW_Resolution.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/WasteManagement/Palo_Alto_ZW_Resolution.pdf, 4 October 2006.

⁶⁵³ Palo Alto, Zero Waste Strategic Plan, www.city.palo-alto.ca.us/zerowaste/documents/Strategic_Plan_Final_100405.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/LongTermInitiatives/WasteManagement/PaloAlto_Strategic_Plan.pdf, 4 October 2006.

CASE STUDY: San Jose, CA

San Jose has been one of the leaders in creating incentives for reducing waste by implementing “pay as you throw”⁶⁵⁴ policies. Citizens are charged to dispose of garbage and the rate is based on the size of garbage carts. Recycling is unlimited at no charge.

As San Jose website states “By recycling as much as you can,

you will be able to use the smaller garbage cart sizes, which cost less.”⁶⁵⁵

San Jose is one of the few cities that recycles more than 64% of their solid waste. Since the curbside recycling started the city has recycled:

372,000 tons of newspaper

277,000 tons of mixed paper

132,000 tons of glass

135,000 tons of mixed recyclables

1,900,000 tons of yard trimmings



San Jose Curbside Setup⁶⁵⁶

CONTACT

Environmental Services
Department
City of San Jose
(408) 535-8550
CleanNGreen@sanjoseca.gov

Tools for Community Waste Prevention

The community waste prevention toolkit was created by INFORM to help a city walk through eight key questions:⁶⁵⁷

1. **Who is responsible for waste disposal, recycling, and waste prevention in your area?**
 - Which political subdivision (e.g., the city, town, county, etc.) is responsible for solid waste prevention, recycling, and disposal policies and programs? What role does the state play in solid waste regulation, funding, etc?
 - Which specific agency or office is responsible for overseeing solid waste prevention, recycling, and disposal? Who heads it? To whom does this agency report on its operation? Are any other governing bodies involved in an

⁶⁵⁴ EPA Pay as You Throw Program www.epa.gov/payt/, 4 October 2006.

⁶⁵⁵ San Jose Pay as you Throw Program, www.epa.gov/epaoswer/non-hw/payt/tools/ssanjose.htm, 5 October 2006.

⁶⁵⁶ San Jose Curbside Setup, www.recycleplus.org/images/curb_setout_lq.jpg, 4 October 2006.

⁶⁵⁷ INFORM, www.informinc.org/cwp_03.php, 4 October 2006.

- oversight or funding capacity?
 - Who is the community (and state) waste prevention program manager? If there is no such position, who is the recycling coordinator? Is promoting waste prevention officially part of his or her job responsibility? Does the community have any additional staff devoted to waste prevention programs and policy development? What are their responsibilities?
2. **What is the size of the waste challenge?**
- How much waste does the community/state generate each year, either by weight (tonnage) or volume (cubic yards)? Are waste generation rates increasing, as they are nationally? Where is this information published? How much waste did the community/state generate in the most recent year? What is the trend in generation over the last five years? Absolute waste and waste per capita? What is projected for the next five? Absolute and per capita?
3. **What goals have been set for waste generation, disposal, recycling, and waste prevention?**
- Do specific goals for waste prevention exist? Are they distinct from goals for recycling? How do the goals compare to
- other state or municipal goals? Have the recycling and waste prevention goals been met? How much waste prevention is projected over the next five years?
4. **How does the community handle its waste?**
- Is it collected by the municipality or by private carters? Is waste generated by residents, institutions and businesses handled differently? How much waste goes to landfill, to incineration, and to recycling? What are the landfill, incineration and recycling trends over the last five years? What is projected for the next five years?
5. **What waste prevention strategies are being used?**
- Does the community operate or fund any materials reuse programs, such as drop-off sites, a telephone hotline or a web site facilitating donations and/or exchanges of furniture, appliances, office equipment, art supplies and other items that can be reused?
 - Has the community or state banned curbside collection or disposal of certain items such as tires, batteries, yard waste, appliances and computer monitors in order to promote reuse and recycling?
- Does the community operate or fund on-site composting, “leave-it-on-the-lawn,” or other waste prevention programs for grass, leaves, food scraps, and other types of organic materials? Does it help residents to set up their own backyard composting systems? Do any public offices or institutions compost their own waste?
 - Does the local government have a program to send surplus items to other public offices or institutions for reuse? Does it operate a surplus warehouse? How does the government agency in charge of the surplus program publicize the availability of reusable items to potential recipients? Is the warehouse easily accessible to government employees? Are available items listed on the Internet?
 - Do local schools and other public institutions with food service facilities use reusable dishes and/or cutlery? If not, do they have access to (and space for) dishwashing equipment? How much are they paying to buy and dispose of single-use items?
 - Are leftover paint, carpet, fixtures and other items from construction projects diverted to other community projects?

6. How does the community educate the public about waste prevention and recycling?

- Are there any ad campaigns devoted specifically to waste prevention? Are any written materials provided to residents, businesses and public institutions? How are they disseminated?

7. What is the waste economic picture?

- How much of the community's budget is used to pay for solid waste collection, processing, and disposal (tipping fees)? What is the budget for waste prevention (beyond what is available to promote recycling)? Is the waste prevention budget commensurate with the portion of waste it is expected to address? What is the cost per ton of the community's waste prevention, recycling and disposal programs?
- Does the community provide residents, businesses, and/or public institutions with economic incentives to reduce their generation of waste? For example, do residents, businesses or public institutions pay for disposal based on the amount of waste they generate?

8. What laws and public policies promote waste prevention?

Has the local or state government adopted any goals or mandates for reducing the amount of waste generated (in addition to recycling goals and mandates)? What are the respective timeframes for reaching these goals or mandates? How does the community plan to measure whether waste reduction goals or mandates have been met?

- Has the community or state passed any legislation promoting waste prevention, such as mandatory bottle deposits or requirements that product manufacturers collect electronics, batteries, carpeting or other items for reuse or recycling (considered to be "extended producer responsibility" requirements).
- Has the locality enacted any executive orders or laws directing government agencies to practice waste prevention and/or environmentally preferable purchasing? Are public agencies encouraged to use products powered by alternatives to batteries or

- to use rechargeable batteries? Do public agencies use duplexing copiers and printers, remanufactured laser toner cartridges and other waste-reducing products? Who is in charge of the community's EPP program?
- Does the local government encourage vendors to practice waste prevention? For example, have government contracts been written to give preference to or require vendors to ship their products in bulk or reusable containers?
- Does the local government or state provide incentives for businesses to practice waste prevention? For example, does it provide financial support to businesses that want to acquire dishwashing equipment? Is technical support available to facilitate waste prevention among businesses? Does the community reward or publicize companies that encourage waste prevention (for example, by taking back hangers and packaging material for reuse)?

Additional Resources

List of Waste Management Resources

www.dnrec.delaware.gov/SWM/TWG/Documents.htm

EPA WasteWise Program

WasteWise is a free, voluntary, EPA program through which organizations eliminate costly municipal solid waste and select industrial wastes, benefiting their bottom line and the environment. WasteWise is a flexible program that allows partners to design their own waste reduction programs tailored to their needs. www.epa.gov/wastewise/

EPA Waste Reduction Model (WARM)

EPA online calculator created to help solid waste planners and organizations track and voluntarily report greenhouse gas emissions reductions from several different waste management practices. yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsWasteWARM.html

U.S. Composting Council

The USCC is a trade and professional organization promoting compost. They are involved in research, public education, composting and compost standards, expansion of compost markets and the enlistment of public support. www.compostingcouncil.org/index.cfm

Grassroots Recycling Network
Zero waste Briefing Kit,
www.grrn.org/zerowaste/kit/briefing/index.html

Conversion facility, fermentation to methane
www.jgpress.com/archives/free/000479.html

Gasification for Power Generation
www.alamedapt.com/newsroom/reports/finalgasification.html

Toronto Study on New Technologies—good brief descriptions
www.toronto.ca/wes/techservices/involved/swm/net/pdf/overview_net.pdf

UC Davis Review of New Technology
biomass.ucdavis.edu/pages/reports/Conversion-PhaseI_IWM-C0172.pdf

City of Berkeley Resolution
No. 62,849–N.S, Adopted March 22, 2005
Reaffirming the city's zero waste goal and referring the issue to the solid waste commission.
www.ci.berkeley.ca.us/sustainable/government/62849.pdf

For more resources, check the footnotes of this document.



**NATURAL
CAPITALISM
SOLUTIONS**

NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. BOX 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548



Chapter 5: Local Action Plan Reducing the Impact of Continuing Emissions

DOCUMENT CONTENTS

Carbon Offsets	207
The Carbon Offset Concept.....	207
The Regulatory Context.....	208
The United States Voluntary Market	209
Chicago Climate Exchange: Membership for Cities.....	209
CASE STUDIES:	
Ballard, WA.....	213
Vail, CO	214
Carbon Sequestration	214
Urban Forests and Green Spaces	214
Soil Conservation	216
Technical Sequestration.....	217
Additional Resources	218

Carbon Offsets

In the summer of 2006, Ballard, Washington announced its goal to become the United States' first "Climate Neutral City," producing net zero greenhouse gas (GHG) emissions. The cities plan includes both reducing emissions as much as it can and then 'offsetting' the remainder.

The city's program to eliminate its carbon footprint includes encouraging citizens and businesses to reduce their emissions and, as well as purchasing carbon offsets from the state chartered non-profit The Climate Trust. The city's efforts follow in the 'low carbon' footprints of numerous businesses and organizations.

For example, both the Republican and Democratic 2004 Conventions in New York City offset the emissions that their meetings caused, and were declared carbon neutral. The National Football League offset the 2006 Super Bowl in Detroit. Nike has a partnership with Delta Airlines to ensure that carbon credits are purchased for all employee flights.⁶⁵⁸ Likewise numerous cities, including Vail, Colorado; Chicago, Illinois; and Berkeley, California, have used carbon credits or renewable energy credits to offset some of their emissions.

The Carbon Offset Concept

A carbon offset is designed to 'cancel out' emissions of one

⁶⁵⁸ Hamilton, Katherine (2006) Master's Thesis. Yale School of Forestry and Environmental Studies. (Available December 2006) Archived at: www.climatemanual.org/Cities/Chapter5/Mitigating/Hamilton_USVoluntaryMarket_DRAFT.pdf, 5 December 2006.

activity by causing equivalent GHG reductions from another activity. The unit of trade is a ‘carbon credit,’ which represents the equivalent of one metric ton of carbon dioxide (CO₂). Various GHGs’ global warming potentials are used as conversion factors. For example, methane is estimated to have a global warming potential (GWP) 23 times higher than CO₂. Thus one ton of methane equals about 23 carbon credits.⁶⁵⁹

Carbon offsets can be created through “project-based transactions” or “allowance-based transactions.”

Project based transactions create credits through projects to reduce GHG emissions. These projects are financed by funds from offset purchases. For example, when students at the Yale School of Forestry and Environmental Studies decided to offset some of the emissions resulting from their graduation, they purchased two different types of project based credits: forestry-based offset credits from a native tree-planting project in the Mississippi River Valley and credits generated from the replacement of diesel generators with solar panels in a Nigerian village. By purchasing third party verified credits from these project developers the school claimed the offsets and the projects received additional funding.

Allowance-based transactions involve credits created through

‘cap and trade’ regimes. Most cap and trade regimes around the world are created by government regulations, which “cap” the quantity of emissions that participants are permitted to emit. The government then issues tradable allowances, which allow participants who have not been able to meet the caps to buy the allowances. These allowances can be bought and sold between participants with the goal of cost effectively reducing net emissions. The largest carbon trading scheme is the European Union Greenhouse Gas Emission Trading Scheme.

The most significant exception to this approach is the Chicago Climate Exchange (CCX, see below). It is a trading system in which members voluntarily agree to what then become for them a legally binding commitments to reduce emissions. Members are then able to trade reductions that exceed their reductions obligations. All voluntary offset purchases, with the exception of CCX transactions, and credits permanently retired from a regulatory market, are based on project-based transactions.⁶⁶⁰ Institutions claiming to have offset their GHG emissions must retire credits purchased.

Institutions and cities voluntarily purchasing credits often set their own operations reductions goals, such as matching Kyoto Protocol goals. They frequently use offsets to help reach these goals.

Others choose to offset the GHG emissions from a particular activity, such as an event or transportation. For example, Chicago’s Bike Chicago festival and Boulevard Lakefront Tour, a partnership with the Metropolitan Mayors Caucus initiative, the non-profit Clean Air Counts, and the company CLIF BAR, Inc. was declared a ‘carbon neutral event’ because they used a zero carbon bike transportation system and because CLIF BAR, Inc donated Renewable Energy Credits (RECs) to offset energy use. (For more information on RECs see below).

Carbon offset credits allow actors to indirectly reduce emissions that cannot practically be reduced at the moment. Buyers of carbon offset credits should always first investigate means of directly reducing their own emissions before investing in other project’s emission reductions.

The Regulatory Context

Since the U.S. does not have national climate change regulation, the majority of U.S. based purchases of carbon offsets are voluntary. However, it is important to note that several state level initiatives have created regulated cap and trade systems that are currently in place or will be operating soon. For example, in 1997, Oregon created the first regulated CO₂ market in the U.S. by capping the

⁶⁵⁹ Source: Bayon, R., Hawn, A., and K. Hamilton (December 2006) Voluntary Carbon Markets: An International Business Guide to What they are and How they Work, Earthscan.

⁶⁶⁰ Hamilton, Katherine (2006) Master’s Thesis. Yale School of Forestry and Environmental Studies. Archived at www.climatemanual.org/Cities/Chapter5/Mitigating/Hamilton_USVoluntaryMarket_DRAFT.pdf, 5 December 2006.

emissions of new power plants. Oregon plants that do not meet this cap may propose their own carbon offset projects or purchase carbon credits from The Climate Trust.

A larger greenhouse gas market is being created by the Regional Greenhouse Gas Initiative. This agreement between Maine, New Hampshire, Vermont, Connecticut, New Jersey, New York, Delaware, and most recently, Massachusetts will utilize a cap and trade program to regulate the CO₂ emissions of power plants. Credits will be created via allowance based and project based transactions.⁶⁶¹

In addition to this carbon dioxide regulation in the Northeast and Mid-Atlantic states, it is probable that a cap and trade system will also develop in the West. California recently set the target of reducing emissions to 1990 emissions levels by 2020. The “AB 32: Global Warming Solutions Act” bill mandates that by 2012 the state will cap emissions from major industries, including utilities, oil and gas refineries and cement manufacturers.⁶⁶²

In signing the bill, Governor Schwarzenegger stated, “We can now move forward with developing a market-based system that makes California a world leader in the effort to reduce carbon emission. The success of our system will be an example for other states and nations to follow as the fight

against climate change continues. AB 32 strengthens our economy, cleans our environment and, once again, establishes California as the leader in environmental protection.”⁶⁶³

As with many initiatives that begin in California, it is likely that this trend will reach other states soon. Within a week of the California announcement, the Governor of Arizona issued a similar executive order. In 2006 the Governors of Arizona and New Mexico Governor signed an agreement launching the Southwest Climate Change Initiative, which establishes a framework for the two states to collaborate on strategies to address the impacts of climate change in the Southwest and reduce greenhouse gas emissions in the region. New Mexico has also joined the Chicago Climate Exchange, becoming the first state in the nation to sign up for this greenhouse gas emission reduction and trading program.⁶⁶⁴

The United States Voluntary Market

Cities interested in offsetting their emissions have two main options. The first is joining the Chicago Climate Exchange (CCX). CCX is “the world’s first and North America’s only legally binding, multi-sector, rule-based and integrated GHG registry, trading and reduction system.”⁶⁶⁵ A second option is purchasing and retiring carbon offset credits or renewable

energy credits (RECs) from a range of suppliers in the broader voluntary market.

Chicago Climate Exchange: Membership for Cities

CCX currently has over 200 Members that range from large US corporations like Ford and Motorola, to universities such as Tufts and University of Minnesota, to small businesses like Natural Capitalism, to farmers in Iowa and Nebraska and the Iowa Farm Bureau. Member Municipalities include Chicago, Illinois; Oakland, California; Boulder, Colorado; Aspen, Colorado and Portland, Oregon.



In Phase I, CCX Members made a voluntary but legally binding commitment to reduce GHG emissions 1% per year for each of years 2003 through 2006, below an average baseline period 1998-2001. Phase II parameters extend the reduction period through 2010, with an additional 2% reduction commitment for current Members and a total of 6% reduction commitment by 2010 for new Members below baseline. CCX Members that reduce emissions beyond their targets can sell the surplus allowances on the Exchange or bank them for later use. Members that do not achieve the annual reduction target must

⁶⁶¹ Point Carbon “Carbon Market Analyst: Carbon Trading in the U.S.: The Hibernating Giant.” 13 September, 2006, www.pointcarbon.com/, 5 October 2006.

⁶⁶² Ibid.

⁶⁶³ Judy Li “Governor, Democrats reach pact” The Sacramento Bee, Thursday, August 31, 2006, Page A1.

meet their compliance commitment by purchasing emission allowances from seller Members. The NASD, the largest private-sector financial regulators, independently reviews emissions.⁶⁶⁶

Goals of CCX are

To establish GHG emissions trading with transparency, design excellence and environmental integrity

To build the skills and institutions needed to cost-effectively manage GHGs in both public and private sectors

To strengthen the intellectual framework required for cost-effective and valid GHG reduction

To incorporate a diverse portfolio of credible GHG emissions offsets from forestry, agriculture and other products

To help inform the public debate on managing the risks of global climate change

Becoming a Municipal Member of CCX

Membership for cities in CCX covers emissions from operations of city government only (buildings, vehicle fleets, etc.). Direct emissions result from the on-site burning of fossil fuels such as natural gas to heat city buildings and gasoline to operate the municipal vehicle fleet. Indirect emissions result from the purchase of power, such as

electricity, and its corresponding emissions.

To become a member, a city must:

Assemble inventory and baseline—energy consumption data for city operations

Submit baseline data to CCX—CCX will provide preliminary analysis

Weigh reduction trends planned, establish reduction schedule

Make a legally binding reduction commitment. This entails joining CCX

Demonstrate progress through annual true-up of actual emissions with predicted reductions. This will then enable a member to buy credits if necessary, sell extra reductions, or trade them

Participate in CCX governance committees (optional)

Benefits of CCX Membership for Municipalities

Ability to take action now—for citizens and future generations

Achieve a first mover role in GHG mitigation efforts—CCX is synergistic with all policy and precludes none, whether state, regional, national, mandatory or voluntary

Contribute to shaping environmental policy by joining a leading group of organizations proactively building the institutions to solve climate change

Increase visibility as a leader and innovator

Develop employee capacities in GHG emissions calculation and trading

Master municipal GHG data, which is essential to achieving any climate change goal

Acquire a state-of-the art, turn-key greenhouse gas emissions management system

Lead by example—setting standards, increase understanding in business and residential community

Reduce cost effectively—while technologies and policies advance, buying allowances may be the most cost effective option for reducing GHG emissions

Earn possible revenue through emission reductions

Have confidence through “gold standard” of NASD independent verification.

Range of Offset Credit Options
CCX is a popular means for cities to offset emissions. However, municipalities and institutions may choose to purchase credits outside of the

⁶⁶⁴ Press conference at the National Governors' Association Meeting Feb 2006, 216.239.59.104/search?q=cache:Rq87W1n0RsMJ:www.governor.state.nm.us/press/2006/feb/022806_01.pdf+New+Mexico+climate+initiative&hl=en&ct=clnk&cd=6&ql=us&client=safari, 15 January 2007.

⁶⁶⁵ Chicago Climate Exchange, www.chicagoclimatex.com, 5 October 2006.

⁶⁶⁶ NASD, www.nasd.com/index.htm, 10 October 2006.

CCX system. Some municipalities may not yet be willing to commit to CCX. Others are interested in encouraging citizens to offset their own emissions (which is not possible via CCX), wish to offset only a specific activity, or want to invest in specific offset projects. For example, the city of Boulder is a member of CCX, but employees in the Office of Environmental Affairs use a variety of retail offset providers to purchase credits to offset the GHG resulting from office travel. Cities may choose to purchase directly from offset project managers, seek out a broker to facilitate the transaction or simply purchase credits from the numerous offset retailers now entering the market.⁶⁶⁷

Offset credits evolve from a variety of sources. As illustrated by the diagram below, project types can be categorized by whether they abate or sequester greenhouse gases. Abatement means reducing the amount of GHGs emitted into the atmosphere. Sequestration

means taking GHGs that would otherwise have been emitted and locking them up either in trees, soil or deep geological formations. The most common project type for sequestering is forestry. Trees, and other plants (especially grasses), absorb CO₂ from the air as they grow, and convert it to woody material. Conversely, when they die or are burned, they release the CO₂. Sequestration programs must ensure that the trees planted actually grow to maturity, and that the resulting wood is not burned on fast rotation.

CCX has also begun offering credits generated from forestry, no-till farming and conversion from conventional farming to organic farming. These techniques build carbon in the soil instead of stripping it out, and thus count as a program to remove carbon from the air durably. Technological sequestration (for example, capturing waste CO₂ that otherwise would have been vented into the atmosphere, injecting it into oil fields to pressurize hard to reach oil

reserves and then trapping the gas in the underlying bedrock) is less common in the voluntary market. However, one organization, Blue Source, in partnership with Natsource, is selling retail level credits from such geological sequestration. For more information on sequestration see below.

Emissions reductions can be further divided into two other categories: fossil fuel reductions versus the capture and destruction of other greenhouse gases, such as methane. The following diagram, modified from the book *Voluntary Carbon Markets: An International Business Guide to What they are and How they Work*,⁶⁶⁸ provides examples of the range of project types used to create credits. Because different projects have a range of co-benefits, prices, advantages and disadvantages, depending on the type, size and location, municipalities purchasing credits should be aware of stakeholder interests and the type of projects behind offsets that providers are offering.

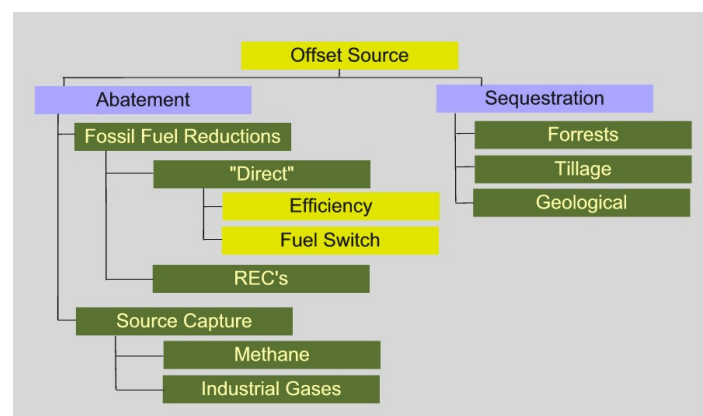


Figure: Carbon Offset Sources⁶⁶⁹

⁶⁶⁷ A directory of retail offset sellers and description of various certification programs is included in: Bayon, R., Hawn, A., and K. Hamilton (2006) *Voluntary Carbon Markets: An International Business Guide to What they are and How they Work*, Earthscan.

⁶⁶⁸ Bayon, R., Hawn, A., and K. Hamilton (2006) *Voluntary Carbon Markets: An International Business Guide to What they are and How they Work*, Earthscan.

⁶⁶⁹ Source: Hamilton, Katherine (2006) "Navigating a Nebula: Institutional Use of the U.S. Voluntary Carbon Market. Master's thesis. Yale School of Forestry and Environmental Studies.

Under the category of fossil fuel emissions reductions, it is especially important to differentiate between reducing what are often regarded as ‘direct emissions’ and buying Renewable Energy Credits (RECs), often called “indirect reduction’ of emissions. RECs are also referred to as Tradable Renewable Energy Certificates (TRECs) or Green Tags. They are a separate commodity from the electricity generated and

represent the environmental attributes that renewable energy generation provides, such as displaced pollution. According to EPA’s Green Power Partnership, voluntary RECs account for 25% of renewable energy currently sold to commercial and industrial customers.⁶⁷⁰ While RECs do mean that fewer emissions are produced when renewable energy is substituted for fossil fuel energy, there is some debate

on how these certificates should fit within the carbon credit market. For example, one concern is the difficulty of measuring exactly how much fossil fuel is backed off the grid due to additions of renewable energy. New renewable energy projects may only displace future power plants that would otherwise be built, not lead to less use of current fossil energy. Hence, RECs are best used to only offset electricity use.

	ADVANTAGES	CHALLENGES
Methane capture from landfills	<ul style="list-style-type: none"> - Efficient means of reducing GHG emissions - Captured methane can be used as fuel - Somewhat reduced odors - Reduced risk of ground water contamination - Relatively inexpensive 	<ul style="list-style-type: none"> - Accounting and baseline concerns should be carefully considered
Methane capture from livestock	<ul style="list-style-type: none"> - Efficient means of reducing emissions - Captured methane can be used as fuel - Reduced odors and co-pollutants - Reduced risk of ground water contamination - Relatively inexpensive 	<ul style="list-style-type: none"> - Accounting and baseline concerns should be carefully considered
Methane capture from coal mines	<ul style="list-style-type: none"> - Efficient means of reducing emissions - Captured methane can be used as fuel - Few leakage concerns - Can improve safety for mine workers - Relatively inexpensive 	<ul style="list-style-type: none"> - Accounting and baseline concerns should be carefully considered
Industrial gas destruction	<ul style="list-style-type: none"> - Very efficient - Highly additional - Relatively inexpensive 	<ul style="list-style-type: none"> - Potential supply is limited
Direct fossil fuel reduction	<ul style="list-style-type: none"> - Supports clean technology - Creates cost savings - Reduces co-pollutants (ex. Sox, PM, VOCs) - Reduces fossil fuel dependency - Potential social benefits 	<ul style="list-style-type: none"> - Less efficient means of reducing GHGs that industrial gas or methane destruction
Renewable Energy Credits	<ul style="list-style-type: none"> - Already established market with certification/verification systems - Supporting on-grid renewable energy important for decreasing reliance on fossil fuels - Reduces co-pollutants (ex. Sox, PM, VOCs) from fossil fuels 	<ul style="list-style-type: none"> - Compatibility issues between markets for RECs and carbon offsets - Accounting and baseline concerns should be carefully considered - Less efficient means of reducing GHGs that industrial gas or methane destruction
Reforestation/ Afforestation of native tree species	<ul style="list-style-type: none"> - Large number of potential social co-benefits - Contributes to biodiversity conservation - Addresses deforestation which is an important part of the climate change problem 	<ul style="list-style-type: none"> - Lack of permanence - Relatively inefficient means of reducing GHGs - Less efficient than many mono-crop projects - Relatively expensive
Avoided deforestation of native tree species	<ul style="list-style-type: none"> - Large number of potential social co-benefits - Contributes to biodiversity conservation - Addresses deforestation which is an important part of the climate change problem 	<ul style="list-style-type: none"> - Lack of permanence - Relatively inefficient means of reducing GHGs - Less efficient than many mono-crop projects - Relatively expensive

⁶⁷⁰ Green Power Partnership website, www.epa.gov/greenpower/, 3 May 2006.

	ADVANTAGES	CHALLENGES
Monoculture forestry	<ul style="list-style-type: none"> - Some potential for social co-benefits - Trees with high sequestration rates can be selected - Often lower cost - Deforestation part of the climate change problem 	<ul style="list-style-type: none"> - Lack of permanence - Relatively inefficient means of reducing GHGs - Concerns about water consumption - Reduced social and environmental co-benefits compared to projects working with native tree species
Soil sequestration	<ul style="list-style-type: none"> - Promotes healthier food production - Reduces erosion - Large number of potential social co-benefits - Improves water quality - Relatively inexpensive 	<ul style="list-style-type: none"> -Lack of permanence - Accounting and baseline concerns should be carefully considered
Geological sequestration	<ul style="list-style-type: none"> - Huge potential for storage - Enhances domestic fuel source 	<ul style="list-style-type: none"> - Enables fossil fuel use, leading to more CO₂ emissions

Carbon Offsets

CASE STUDY: Ballard, WA

Citizens, business owners and local governments have joined forces in a campaign to make Ballard, Washington, the United States' first "carbon neutral city." The goal is to educate residents on how they can reduce and then offset emissions. The non-profits NetGreen and Sustainable Ballard are organizing the program by "empowering individuals, businesses and communities to achieve a net reduction in emissions today, while working to reduce their emissions over time."⁶⁷¹ NetGreen has partnered with the state-chartered non-profit, The Climate Trust, to provide offset purchases. The Climate Trust invests funds from Oregon power plants as well as citizens and businesses voluntarily offsetting their emissions in projects, which reduce GHG emissions.⁶⁷² Buyers can estimate their

emissions online and then purchase offsets from Climate Trust at \$10 per ton of carbon.

While this program is primarily driven by local non-profits, local government representatives have been actively involved. At the kick-off, King County Council member Larry Phillips pronounced:

By the will of the people, the governments of King County and Seattle have become national leaders in developing global warming solutions. We're here today to show that the individual efforts of all of us add up quicker than you think and can have a tremendous impact—right now. I congratulate Ballard and challenge other neighborhoods to follow suit."⁶⁷³

Convincing people not only to reduce their emissions but also individually to purchase offsets is a major challenge. One local business owner, who calculated that it would take \$100 a year to offset her business' emissions commented, "right now I can't afford it, but I definitely would."⁶⁷⁴ However, a range of local residents, businesses and organizations have already committed to reducing their carbon footprint. For example, several churches, a high school and businesses from a radio station to a dry cleaner have signed on to the effort.

CONTACT

Tracy Carroll
NetGreen
(206) 391-6744

⁶⁷¹ NetGreen website, www.achieve.netgreen.org/, 5 October 2006.

⁶⁷² The Climate Trust, www.climatestrust.org/, 5 October 2006.

⁶⁷³ "Local Leaders Pledge to Make Ballard First 'Carbon Neutral' Community in the United States." Seattle Daily Business News. 4 October, 2006.

⁶⁷⁴ Ibid.

CASE STUDY: Vail, CO

In August 2006 the city of Vail signed an agreement to offset 100% of its electricity use over the next three years, or about 20 million kilowatt hours of electricity use.⁶⁷⁵

The agreement followed Vail Resorts' purchase of RECs to offset energy use of all its properties, such as its ski resorts, shops and hotels, making them the second largest purchaser of wind power of all corporations in the United States.⁶⁷⁶ The RECs

purchased from the Boulder based Renewable Choice Energy will cost the city of Vail about \$12,000 per year in addition the regular energy bill.

Vail Town Manager Stan Zemler, explained the town's motivation. "We believe that protecting Vail's natural environment is critical to the health and prosperity of our community. Wind power is a simple step in continuously improving our

environmental practices at the town."⁶⁷⁷ The city estimates this effort will reduce about 14,000 tons of carbon dioxide that would otherwise have been emitted into the atmosphere and equates this effort to taking 2,600 cars off the road.

CONTACT

Stan Zemler
Vail Town Manager
(970) 479-2105

Carbon Sequestration

Vegetation on land and in the ocean is considered a carbon 'sink' because it removes carbon from the atmosphere, storing it as biomass. Numerous human activities, such as deforestation and carbon intensive agricultural practices, are reducing the total amount of carbon sequestered in these stocks. Human driven land use changes, along with increased emissions of greenhouse gases, have contributed significantly to climate change. Cities can help fight climate change and reap numerous other benefits by increasing the number of carbon sinks in their communities.

Urban Forests and Green Spaces

Planting and maintaining trees and green spaces is the easiest means of increasing carbon sequestration within most communities.⁶⁷⁸ Due to the numerous benefits of tree planting projects and green spaces, such as community gardens, roof gardens and parks, many cities around the U.S. have been motivated to literally 'green' their communities.

Urban forests sequester carbon and also save energy. Urban absorption of heat due to lack of trees is known as an "urban heat island effect." When strategically planted, trees can decrease energy costs by shading buildings, pavement and vehicles

in the summer, as well as blocking winds in the winter. American Forests calculates that a single tree will sequester one ton of carbon over a 40 year life. They calculate that due to mortality, three trees must be planted to insure that one will have a 40 year life.⁶⁷⁹

For example, the Chicago urban tree canopy removes 15 metric tons of carbon monoxide, 84 metric tons of sulfur dioxide, 89 metric tons of nitrogen dioxide, 191 metric tons of ozone and 212 metric tons of particulates each year, according to David Nowak, project leader of the U.S. Forest Service's Urban Forest Ecosystem Research Unit. Sacramento, California, planted more than 200,000 trees around the city in the mid-1990s.

⁶⁷⁵ Stoner, Edward. "The Town of Vail goes all wind power too." Vail Daily. 7 August, 2006.

⁶⁷⁶ Vail resorts website, www.vailresorts.com/, 5 October 2006.

⁶⁷⁷ "TOV 100 Percent Powered by Wind" Press Release, 15 September 2006. ci.vail.co.us/release.asp?r_id=2856, 5 October 2006.

⁶⁷⁸ Some scientists challenge the idea that planting forests outside of the tropics helps reduce global warming, pointing out that forests trap more heat than they get rid of by sequestering carbon. However, in cities, planting and maintaining trees does appear to be a net reduction of global warming. For more information, environment.guardian.co.uk/climatechange/story/0,,1972729,00.html, 15 January 2007.

⁶⁷⁹ The Urban Forest Network Newsletter, <http://www.thefreelibrary.com/Parks+as+Lungs-a079575245>, "Parks as Lungs" by Roddy Scheer, 11 April 2007.

Greg McPherson of the Western Center for Urban Forest Research found that the region's urban forest removes more than 200,000 metric tons of carbon dioxide from the atmosphere each year, saving taxpayers as much as \$3 million annually in pollution cleanup costs.⁶⁸⁰

A study in Los Angeles showed that urban forestry and such measures to reduce the urban heat island as the use of light colored paving and roofs could cool the city by about 6 degrees. This would cut the city's cooling loads by about 20% and smog by

about 12%. A similar program nationwide was estimated to be able to save \$4 billion a year on air conditioning costs, 7 million metric tons of annual carbon emissions. For these reasons, an urban tree keeps about nine times as much carbon out of the air as the same tree planted in a forest.⁶⁸¹

The city of Boulder, Colorado, which has integrated forestry into its climate strategy, estimates its 400,000 trees on public and private land are storing an estimated 110,000 million tons of carbon.

Through new growth, sequestration and energy savings Boulder estimates the city's trees result in another additional reduction of 43,000 million tons of carbon each year, which they compared to offsetting the carbon "released through driving approximately 16.1 million miles each year."⁶⁸² The city of Boulder's Climate Action Plan notes, "According to the U.S. Forest Service, trees properly placed around buildings can reduce air conditioning needs by 30% and can save 20-50% in energy used for heating."⁶⁸³

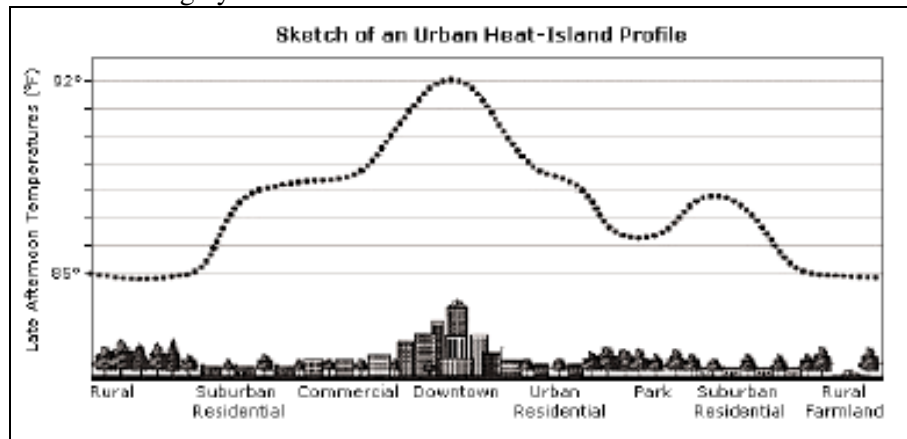


Figure: City of Cambridge Massachusetts Climate Protection Plan⁶⁸⁴

Such energy savings can equate to considerable dollar savings. Boulder estimates the city's trees provide an average energy savings 950 kWh for a one or two story single family detached home, saving families an average of \$58/year. A 2005 analysis of municipal tree resources found that each dollar invested in maintaining public trees resulted

in \$3.64 in benefits due to avoided costs for energy consumption, air pollution control, as well as other benefits.⁶⁸⁵

Proponents of such land use changes also note that green space and forestry are tangible and emotionally appealing. Moreover, at some point most

citizens have learned about the role trees play in the carbon cycle and hence, can identify with the role of trees in GHG mitigation. Creating and maintaining green space is thus an easy way to involve all ages in a city's climate action plans. Municipalities can greatly benefit from this citizen involvement. For example, the

⁶⁸⁰ The Urban Forest Network Newsletter, www.leaf.toronto.org/UFNnews32.pdf, 5 October 2006.

⁶⁸¹ Art Rosenfeld, et al, "Policies to Reduce Urban Heat Islands," LBL 38679, Lawrence Berkeley National Laboratory, 1996, and Rosenfeld, "The Art of energy Efficiency," Annual Review of Energy and Environment 1999.

⁶⁸² City of Boulder Climate Action Plan.

⁶⁸³ 161.98.15.236/files/Environmental%20Affairs/climate%20and%20energy/cap_final_14aug06.pdf#search=%22Boulder%20Climate%20Action%20Plan%22, also archived at, www.climatemanual.org/Cities/Chapter5/Mitigating/Boulder_CAP_14aug06.pdf, 5 October 2006.

⁶⁸⁴ Ibid.

⁶⁸⁵ Cambridge Climate Protection Plan, www.ci.cambridge.ma.us/cdd/et/env/clim_plan/clim_plan_full.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/Mitigating/Cambridge_ClimatePlan.pdf, 5 October 2006.

⁶⁸⁶ Ibid.

city of Cambridge's Climate Protection Plan states that the wide range of organizations working on issues related to land use have been critical to creating and maintaining green spaces and trees in the community.⁶⁸⁶

Urban forestry and green spaces also have numerous other benefits, including:

Reducing storm water run-off and soil erosion

Improving local air quality

Providing habitat for wildlife

Adding beauty—aesthetics

Increasing property values and residents' quality of life

Despite the benefits associated with urban forestry and green spaces, cities promoting these activities face a range of challenges. A fundamental issue is maintaining vegetative health. Despite the city of Boulder's efforts to promote urban forestry their Climate Action Plan notes that due to recent droughts and budget costs the city has had a net loss of trees, removing 230 trees per year on average (nine-year average) and planting 130 trees per year on the same nine-year average. "To maintain the stream of environmental benefits provided by our urban forest, urban trees must be managed to

maintain optimal health and the city must have, at a minimum, a replacement program that offsets the number of removals."⁶⁸⁷

Recognizing such challenges, the city of Minneapolis created an urban forest policy designed around "best management practices to mitigate tree loss and tree damage and to promote the long-term health of urban trees."⁶⁸⁸

Other urban reforestation issues relate to permanency and accounting. For example, while Boulder has carefully considered the role of trees in its Climate Action Plan, because the city has not been collecting forestry data since 1990, the city's urban forests have not been included in the GHG accounting inventory. Some uncertainty also surrounds sequestration rates for various vegetation types. Due to the time, cost and evolving scientific understanding around sequestration, municipalities must gauge the benefits of accuracy versus estimates. It is also important to remember that if these trees are destroyed, whether due to human intervention or natural causes, carbon stored in vegetation is released back into the atmosphere. Therefore, it is critical they be regarded as, and accounted for as a temporary sink, rather than a permanent reduction.

Soil Conservation

According to the United States Department of Agriculture, "Soil is the largest terrestrial global carbon pool, estimated to be about one-and-a-half trillion tons."⁶⁸⁹ However, farming practices have severely depleted soils' organic carbon levels in many agricultural areas.

For municipalities that encompass agricultural areas, providing incentives for agricultural best management practices to sequester carbon is an important step in climate protection. For example, the practice of no-till or conservation tillage⁶⁹⁰ farming, which can increase the amount of storage in the soil and reduce emissions from farm equipment used to till the fields has gained considerable attention recently. Other best management practices that contribute to sequestration include organic agriculture, changing grazing practices to forms of "Holistic Management,"⁶⁹¹ converting marginal agricultural land to grassland, forests or wetland and grass buffers.

The following Environmental Protection Agency (EPA) chart summarizes some of these activities and their benefits.

⁶⁸⁶ Ibid.

⁶⁸⁷ City of Boulder Climate Action Plan.

⁶⁸⁸ 161.98.15.236/files/Environmental%20Affairs/climate%20and%20energy/cap_final_14aug06.pdf#search=%22Boulder%20Climate%20Action%20Plan%22, also archived at, www.climatemanual.org/Cities/Chapter5/Mitigating/Boulder_CAP_14aug06.pdf, 5 October 2006.

⁶⁸⁹ City of Minneapolis 2004 Environment Report, www.ci.minneapolis.mn.us/environment/docs/MPLSEnvOverview071604.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/Mitigating/Minneapolis_CAP.pdf, 5 October 2006.

⁶⁹⁰ USDA Agricultural Research Service, www.ars.usda.gov/research/, 5 October 2006.

⁶⁹¹ Also in this manual, see Chapter 5, Long Term Initiatives, Sustainable Agriculture section.

⁶⁹² See Dan Dagget, *Gardeners of Eden*, Tarcher, 2005.

Key Agricultural Practices	Typical definition and some examples	Effect on greenhouse gases
Conservation or riparian buffers	Grasses or trees planted along streams and croplands to prevent soil erosion and nutrient runoff into waterways.	Increases carbon storage through sequestration.
Conservation tillage on croplands	Typically defined as any tillage and planting system in which 30% or more of the crop residue remains on the soil after planting. This disturbs the soil less, and therefore allows soil carbon to accumulate. There are different kinds of conservation tillage systems, including no till, ridge till, minimum till and mulch till.	Increases carbon storage through enhanced soil sequestration, may reduce energy-related CO ₂ emissions from farm equipment, and could affect N ₂ O positively or negatively.
Grazing land management	Modification to grazing practices that produce beef and dairy products that lead to net greenhouse gas reductions (e.g., rotational grazing).	Increases carbon storage through enhanced soil sequestration and may affect emissions of CH ₄ and N ₂ O.

Table: U.S EPA⁶⁹²

Along with sequestration there are numerous co-benefits associated with such changes in land management practices including reducing soil erosion, reducing emissions from farm equipment, increasing the levels of organic material in the soil and reduced water pollution. Like other forestry and green spaces activities, such co-benefits can be the drivers in implementing activities. For example, the Miami Conservancy District in Dayton, Ohio has recently initiated a water quality trading program that provides funding for changes in agricultural practices, such as no-till farming and conservation buffers, to reduce nitrogen and phosphorus water pollution.⁶⁹³ A major side benefit is increased carbon sequestration.

Challenges associated with utilizing agricultural land use changes in municipal climate protection plans include accurately accounting for carbon storage and the fact that a relatively small amount of carbon is stored per acre. Moreover, carbon sequestered

can be quickly lost in a season when a farmer changes tilling practices. Municipalities considering creating incentives for increased soil sequestration will need to ensure that the benefits of carbon storage, reduced emissions and other co-benefits will be maintained.

Technical Sequestration

Included within the context of sequestration is technical sequestration. Due to high costs and evolving technology, this type of sequestration is not yet applicable for most municipal climate strategies. However, a brief introduction is provided for context.

New and evolving means of technologically sequestering include geological and oceanic storage. The potential benefit of these methods is their huge potential for rapid sequestration, especially in comparison to terrestrial sequestration. Geological storage involves capturing carbon dioxide from pollution sources and then

injecting it into geological formations in the earth. Examples include enhanced oil recovery or “clean” coal production in which the carbon (and mercury) is stripped off in gasification and then sequestered. Oceanic sequestration involves pumping carbon dioxide deep into the ocean.

One real challenge with all of these methods is that it is not entirely clear whether the carbon will stay where it is put. The permanency of the sequestration is a major concern and risk for both technologies. There are also concerns about such environmental risks as changes in ocean acidity. Because the understanding of the risks and benefits of this technology is still evolving, while technical sequestration may become a significant means of mitigating climate change in the future, land use changes represent a more accessible means for municipalities to encourage sequestration at present.

⁶⁹² EPA Carbon Sequestration in Agriculture and Forestry, www.epa.gov/sequestration/ag.html, 4 October 2006.

⁶⁹³ Hamilton, Katherine. “Testing the Waters: The Great Miami River Watershed Water Quality Credit Trading Program.” The Katoomba Group Ecosystem Marketplace. September 2006.

Additional Resources

**Voluntary Carbon Markets:
An International Business
Guide to What they are and
How they Work**, Bayon, R.,
Hawn, A., and K. Hamilton
(2006) Earthscan

EPA calculators.
yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterToolsCalculators.html

My Climate video on the carbon offset concept:
www.myclimate.org/film/film_en.php

Consumers' Guide to Retail Carbon Offset Providers
Clean Air-Cool Planet has released a new report designed to help organizations and individuals that are considering purchasing offsets to help achieve carbon neutrality. The report evaluates 30 providers selling offsets in the US market on seven criteria and explains some of the key attributes that consumers should look for when purchasing carbon offsets. The survey and report were undertaken by Trexler Climate + Energy Services, Inc. of Portland, Oregon.
www.cleanair-coolplanet.org/ConsumersGuidetoCarbonOffsets.pdf



NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. Box 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548



Chapter 5: Develop a Local Action Plan Adapting to Climate Change

DOCUMENT CONTENTS

Emergency Planning	221
Rising Sea Levels	221
Different Precipitation and Temperature Patterns	222
Changes in Precipitation, Water Supply and Water Quality	223
Emergency Response to Floods	225
Increased Insect Reproduction Rate	225
Increased Human Health Impacts	226
CASE STUDIES:	
Philadelphia, PA	227
Chicago, IL	228
Additional Resources	229

There are a number of daunting risks that communities eventually need to manage as climate change continues and the broader weather-related affects of global warming become more obvious. The full extent of the positive and negative implications, scope and pace of these effects are not 100% understood, but it is agreed that increases in greenhouse gases loading in the atmosphere will cause such impacts as:

Rising sea levels flooding low-lying coastal plains across the world, forcing population centers to evacuate and damaging trillions of dollars worth of infrastructure;

Different precipitation and temperature patterns impacting livestock and crop production, water supplies, health of forests, biological diversity, wild-life habitat, coastal and inland wetlands, vegetation and stream flow;

Increased insect reproduction rate and expanded geographic distribution of vector-borne disease;

More frequent and more severe summer and winter storms, including hurricanes, tornadoes and floods, and more frequently occurring events characterized by extreme heat, cold or drought conditions, including wildfires, windstorms, hailstorms and ice storms;

Loss of economic output and local tax revenues due to extreme weather conditions, missed work days, power failures, decreased tourism, property damage, property devaluation, and loss of crops and livestock;

Increased human health impacts derived from increased emissions of SO₂, NO_x, CO and particulate matter resulting in higher levels of ground-level ozone, lung disease, emphysema and asthma; and

Higher sickness or mortality rates of elderly and ill people due to extreme heat and cold or inability to leave their homes for medical or other purposes.

Managing these effects of climate change will require planning,

investment of resources, outreach to the community and coordination of multiple agencies on both the local and federal level. This chapter briefly describes a some of the strategies for managing these potential impacts.

Emergency Planning

On average, the federal government needs 72 hours to marshal national resources in response to an incident that has surpassed a state's response capacity.⁶⁹⁴ Usually, a 72-hour delay is not a problem. State and local governments manage most of the responders that arrive immediately at a disaster scene and, in most circumstances, have the critical assets needed to carry themselves through the first three days. This was largely the case even during terrorist attacks, such as the bombing of the Alfred P. Murrah Federal Building in Oklahoma City and both attacks on the World Trade Center in New York City. On the other hand, when catastrophic disasters overwhelm state and local governments at the outset, as in the aftermath of Hurricane Katrina, the 72-hour buffer disappears, and any delays in a coordinated federal, state and local response cause serious consequences.

Better planning at regional and local levels are needed to prevent

such shortfalls in disaster response. Such efforts need to take the form of city or state-based regional programs that focus on ensuring that local communities are prepared to sustain themselves and to facilitate cooperation among federal, state and local efforts. For example, in Dayton, Ohio, a Homeland Emergency Learning and Preparedness (H.E.L.P.) Center, which offers disaster preparedness training to emergency responders and the general public, has been supported at the state and city level.⁶⁹⁵

In the Homeland Security Act of 2002, Congress mandated that the Department of Homeland Security (DHS) set up a regional structure that coordinates and collaborates with state-based regional programs to help to close the 72-hour gap.

Rising Sea Levels

Rising sea levels is a potentially major result of climate change. There are many kinds of coasts, each with different ecological characteristics, economic values, and natural and human uses. In some areas, such as the remote shorelines in California or Oregon the sea is contained by high cliffs and rising sea levels will not be catastrophic. Segments of vulnerable, yet economically valuable,

shorelines are often protected with hard structures such as seawalls. Although some coastal areas are somewhat protected by these structures, it is not known how sea level rise, sporadic storm activity, and shoreline hardening harm the ecological services of shoreline habitats. These habitats provide physical and biological buffers in estuaries and are essential to sustainable fishery production and other ecological values. In low-lying urban shorelines, such as Los Angeles, San Francisco, Miami and Manhattan, the impacts could be devastating. Sea level rise is not an easy process to predict or manage, because the rate of change and accompanying shifts in wave activity and storm surges are not well understood. City planners and resource managers have a big job in front of them.

The effects of sea level rise include tidal inundation of low lying areas; coastal erosion of wetlands, beaches, and other types of shores; vertical accretion of wetlands; increased coastal flooding during storm surges and periods of extreme rainfall; and increased salinity of aquifers and estuaries, especially during droughts.⁶⁹⁶ Estuarine shorelines are already under the stress of increased water levels ranging from short term waves and storm surge to long term inundation through existing sea level rise.

⁶⁹⁴ "State and Regional Responses to Disasters: Solving the 72-Hour Problem", The Heritage Foundation, by Jill D. Rhodes, J.D. and LL.M., and James Jay Carafano, Ph.D. Backgrounder #1962, at website: www.heritage.org/Research/HomelandDefense/bg1962.cfm, 15 August 2006.

⁶⁹⁵ Homeland Emergency Learning and Preparedness (H.E.L.P.) Center, www.emhelpcenter.org/, 15 October 2006.

⁶⁹⁶ For more information, U.S. Climate Change Science Program www.climatechange.gov, 12 August 2006.

The first and most important action that cities can take is to gather resource data about their shoreline and develop GIS (Geographic Information Systems) models to measure and model possible effects of climate change on coastal resources and human habitat. Many federal agencies and individuals are developing data that can provide insights regarding the implications of sea level rise.

For example, the Federal Emergency Management Agency (FEMA), the Army Corps of Engineers, and several states

management. The National (Florida, Texas, North Carolina, and California) are developing elevation data for floodplain Oceanic and Atmospheric Administration (NOAA) and United States Geological Survey (USGS) are developing Digital Elevation Models (DEMs). Local governments and major coastal conservancies are developing GIS land-use data for managing ecosystems and economic activity. The U.S. Fish and Wildlife Service (USFWS) is developing wetlands data. These agencies all have information resources to help local and state

governments develop their own models and action plans.⁶⁹⁷

Cities should work in coordination with counties, states and federal agencies in developing a baseline of resource data and models to help understand the full range of possible impacts of higher sea levels on local ecological resources, human habitat and economic activity. The following table provides names and contact information for the agency leaders who are working coastal issues related to climate change.

<u>CCSP Agency</u>	<u>Contact</u>	<u>E-mail</u>
USEPA	James G. Titus	Titus.jim@epa.gov
NOAA	Mike Szabados	Mike.Szabados@noaa.gov
USGS	Eric Anderson	Eric.K.Anderson@noaa.gov
USFWS	Brian Czech	brian_czech@fws.gov
Corps of Engineers	Charles Chesnutt	Charles.b.Chesnutt@usace.army.mil
FEMA	Mark Crowell	Mark.Crowell@dhs.gov
DOE	Anjuli Bamzai	anjuli.bamzai@science.doe.gov
NASA	Eric Lindstrom	Eric.J.Lindstrom@nasa.gov

Table: List of key agency contacts working on sea level rise, August 2006

The program managers listed above are responsible for developing a report titled: “Coastal Elevations and Sensitivity to Sea Level Rise.” The lead agencies are USEPA, NOAA, USGS. This report is available on line and will help city governments get started.⁶⁹⁸

Another information resource about adapting to climate change impacts is provided on line by the World Health Organization.⁶⁹⁹

Different Precipitation and Temperature Patterns

Yet another set of challenging issues city governments must plan to address for the safety and survival of their citizens are changes in precipitation patterns and changes in average mean temperatures that could arise from climate change. These impacts are difficult to prepare for because the long-term effects

of climate change on precipitation patterns and mean temperatures are still unknown. Temperature and precipitation patterns are both affected by cloud cover, wind, solar radiation, topography and numerous other physical features that are difficult for scientists to model.

Moreover, the impacts will vary regionally, meaning that cities will have to develop unique, local action plans. San Francisco’s action plan for addressing change in

⁶⁹⁷ For more information, please visit the website hosted by The U.S. Climate Change Science Program, at: www.climatechange.gov/Library/sap/sap4-1/default.htm, 14 August 2006.

⁶⁹⁸ Ibid.

⁶⁹⁹ Climate Change and Adaptation Strategies for Human Health, www.who.dk/ccashh, 5 October 2006.

precipitation and change in mean temperatures will undoubtedly be different from Salt Lake City's or Atlanta's. The impacts on agricultural areas will be different from what will challenge an urban area. Again, city governments will frequently be working with county, state and federal agencies to address these issues. The following information can provide city governments with a general understanding of potential impacts on precipitation levels and water supplies that climate change can impose.

Changes in Precipitation, Water Supply and Water Quality

Changes in weather patterns, snow cover, ice and precipitation are likely results of a warming climate. Examples of these include a more active hydrological cycle with more heavy precipitation events and shifts in precipitation in some regions while others enter prolonged droughts. There is already widespread retreat of non-polar glaciers, increases in ocean-heat levels and decreases in snow cover, sea-ice extent and thickness. For instance, it is very likely that 20th century warming has contributed significantly to the current observed sea-level

rise, through thermal expansion of seawater and widespread loss of land ice.⁷⁰⁰

Among the expected impacts of climate changes on water resources are higher global and regional water temperatures, increases in global average precipitation and evaporation, changes in the regional patterns of rainfall, snowfall and snowmelt, changes in the intensity, severity and timing of major storms and a wide range of other geophysical effects. These changes will also have many secondary impacts on freshwater resources, altering both the demand and supply of water and changing its quality.⁷⁰¹

Evaporation of water from land and water surfaces will increase as global and regional temperatures rise. More evaporation will result in more precipitation on average, though regional precipitation patterns will continue to be very complex and variable. Reviews of state-of-the-art climate models suggest that *global average evaporation and precipitation may increase by 3 to 15% from an equivalent doubling of atmospheric CO₂ concentration*. The greater the warming, the larger these increase.⁷⁰²

One of the most important hydrologic impacts of climatic change will be snowfall and

snowmelt changes in high altitude watersheds or areas with strong snowmelt runoff characteristics. In these watersheds, changes in temperature are expected to lead to important changes in water availability and quality and complicate the management of reservoirs and irrigation systems.

The Intergovernmental Panel on Climate Change (IPCC) stated "freshwater resources in many regions of the world are likely to be significantly affected," and that many current freshwater problems will be made worse by the greenhouse effect. They urge water managers to begin "a systematic reexamination of engineering design criteria, operating rules, contingency plans, and water allocation policies." The report states with "high confidence" that "water demand management and institutional adaptation are the primary components for increasing system flexibility to meet uncertainties of climate change."⁷⁰³ This emphasis on demand management rather than construction of new facilities marks a change in traditional water management approaches, which in the past have relied on the construction of large and expensive supply infrastructure.

Water demand-side management (DSM), is the water equivalent of energy efficiency: cheaper, faster

⁷⁰⁰ "Climate Change 2001: Synthesis Report Summary for Policymakers," An Assessment of the Intergovernmental Panel on Climate Change, at website, www.ipcc.ch/pub/un/syrenq/spm.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/Adapting/spm.pdf, 5 October 2006.

⁷⁰¹ "Water Planning and Management Under Climate Change," Peter H. Gleick, Co-Founder and President of the Pacific Institute for Studies in Development, Environment, and Security in Oakland, California, www.ucowr.siu.edu/updates/pdf/V112_A5.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/Adapting.pdf, 14 August 2006.

⁷⁰² Ibid.

⁷⁰³ For more technical reports on climate change and water resources, biodiversity, etc., visit the IPCC website at: www.ipcc.ch/pub/techrep.htm, 14 August 2006.

and clearly the first option to be pursued. It reduces demand for water by increasing the efficiency of water services, and water conservation (which conserves water by decreasing its use). These are not new ideas. Cities and water districts in the western U.S. have had water conservation programs for many years, targeting both residential users and commercial/agricultural customers. For example, in 1989, Goleta, California, faced drought and the threat of a multi-million-dollar expenditure to meet EPA sewage-treatment standards. This spurred a \$1.5-million municipal program that provided information and incentives to the town's 74,000 citizens to reduce water waste. More than 17,000 ultra-low-flow toilets were installed in a few years. The utility gave away 35,000 high-performance showerheads, reformed its tariff structures, made metering universal, raised public awareness and knowledge and offered free onsite surveys of outdoor water-efficiency opportunities. These technical improvements, plus some emergency drought measures (peak-season surcharges and a little rationing), cut citywide water consumption within a single year, 1989–90, by 30%, from an average of 135 to 90 gallons per person per day—twice the targeted savings. Sewage flow fell by over 40%, enabling the existing plant to run within its rated capacity and EPA secondary standards. The proposed plant expansion was

indefinitely deferred. Total water savings later grew to 40 percent. In the drought of 1990, while some nearby communities were forced to cut their water use by 30–45%, Goleta had only to reduce 15%, avoiding disruption or hardship.⁷⁰⁴

In 1994, Mayor Martin J. Chavez and the Albuquerque City Council called for a 30% reduction in water use over 10 years. The response by city water customers was strong, with per person usage dropping from 250 gallons per capita per day when the program began in 1995, to 174 by the end of 2005. Per household analysis in 2004 shows a reduction of 34% compared to the baseline use in 1995. Residential customers, who represent approximately 50% of all water use, have reduced their usage by 39% since the program began. Institutional customers, whose numbers are much smaller, have achieved similar results. Commercial and industrial customers are being urged to respond accordingly.⁷⁰⁵

Some features of the program in Albuquerque include:

Offering rebates for low flow toilets (the largest source of water use in most American homes);

Offering free low flow shower heads;

Offering free public courses on Xeriscape (low water/draught resistant) gardening techniques; and

Offering rebates for high-efficiency washing machines (high-efficiency washers use approximately 25 gallons per load versus 40 to 50 gallons per load)

In the event of a longer drought period, communities would need more aggressive action plans for water DSM and conservation. Large cities and agricultural areas will adopt different strategies for functioning under extended drought conditions, including looking for new suppliers, developing new supplies, and deepening wells on the supply-side. As climactic regimes shift, it is likely that agriculture will shift as well, and crops that may have predominated in an area will no longer be grown.

New Mexico State University provides a very comprehensive, on-line template for community-scale drought emergency planning.⁷⁰⁶

This template assists water officials to plan for four different phases of an action agenda:

Drought alert;

Conservation;

Restrictions; and

Emergency.

In worst-case scenarios, some cities may have to limit water usage, in both residential and commercial/agriculture sectors. This could raise the price of food,

⁷⁰⁴ Hawken, Lovins and Lovins, *Natural Capitalism*, P. 231, Little Brown, NY, 1999.

⁷⁰⁵ City of Albuquerque, www.cabq.gov/waterconservation, 13 August 2006.

⁷⁰⁶ "Action Plan for Emergency Drought Management: Short-term Strategy," New Mexico State University, website, weather.nmsu.edu/drought/action-plan/index.htm, 13 August 2006.

and cause unemployment in farming and ranching communities.

Emergency Response to Floods

In addition to conserving water during or in anticipation of drought periods, many cities must also address the other important water-related impact of climate change: increased precipitation. Increased evaporation will beget more cloud cover, which will deliver more frequent rain and snow storms in different regions. Rain patterns could greatly differ from year to year across the U.S.

Many cities already have flood action plans. The breaking of the Corp of Engineers' levees in New Orleans under hurricane Katrina has precipitated much discussion about national preparedness for storm surges. The Center for Disease Control (CDC) provides an online tool describing preparations individual households can make in the event of flood conditions to which cities can refer their citizens. The CDC manual provides information on keeping food and water safe, sanitation, re-entering the home, electrical hazards, etc.⁷⁰⁷ Cities that do not have flood or drought action plans can get assistance from the Corps of Engineers. The Corps can provide many different types of assistance under the Flood

Control and Coastal Emergency Act (Public Law 84-99), the National Emergency Preparedness Program (NEPP) and the Federal Response Plan and can provide planning assistance to cities.

The Department of Homeland Security has a new program called Citizen Corps. It hopes to recruit volunteers to be trained for emergency response in situations such as floods, ice storms, power outages, and extreme heat. Cities can leverage this federal program as well to help residents prepare for extreme conditions.⁷⁰⁸

Increased Insect Reproduction Rate

With warmer weather and more moist conditions in some parts of the country, another potential issue is increased insect reproduction rates and a greater distribution of vector-borne disease, such as malaria, dengue fever and Lyme disease.⁷⁰⁹ Most cities or counties have pest management programs in place governing both agriculture and urban settings. These programs may have to be strengthened in, some regions as climate change produces conditions for faster reproduction of mosquitoes and other disease-carrying insects.

The U.S. Department of Agriculture has developed the "Integrated Pest Management

(IPM) Road Map."⁷¹⁰ The goal of the IPM Road Map is to increase nationwide communication and efficiency through information exchanges among federal and non-federal IPM practitioners and service providers including land managers, growers, structural pest managers and public and wildlife health officials.

At the Federal level, the IPM program is a multi-agency effort that demands coordination and collaboration. The Federal IPM Coordinating Committee provides oversight of the federally funded programs. This committee is made up of representatives of the major participating Federal agencies and departments. The USDA IPM Coordinator is responsible for preparing an annual report documenting the status and performance of the IPM program nationally and distributing the report to Congress, Federal and State IPM partners, and the general public.

USDA Regional IPM Centers play a major role in gathering information concerning the status of IPM, and in the development and implementation of an adaptable and responsive National IPM Road Map. These Centers have a broad, coordinating role for IPM and they invest resources to enhance the development and adoption of IPM practices at the level of cities and local government.

⁷⁰⁷ CDC online tool, www.bt.cdc.gov/disasters/floods/, 14 August 2006.

⁷⁰⁸ For more information, see Department of Homeland Security website: www.citizen corps.gov/, 14 August 2006.

⁷⁰⁹ World Health Organization 2000 Bulletin, [whqlibdoc.who.int/bulletin/2000/Number%209/78\(9\)1136-1147.pdf](http://whqlibdoc.who.int/bulletin/2000/Number%209/78(9)1136-1147.pdf), also archived at, www.climate manual.org/Cities/Chapter5/Adapting/WHO_vectorborne_2000.pdf, 5 December 2006.

⁷¹⁰ National Road Map For Integrated Pest Management, May 17, 2004, no author name. Website: www.ipmcenters.org/IPMRoadMap.pdf, 20 August 2006, also archived at, www.climate manual.org/Cities/Chapter5/Adapting/IPMRoadMap.pdf, 30 October 2006.

Increased Human Health Impacts

A study, by scientists at the World Health Organization (WHO) and the London School of Hygiene and Tropical Medicine, determined that 160,000 people already die every year from the effects of climate change, from malaria to malnutrition, children in developing nations seemingly the most vulnerable. The study projected that these numbers could almost double by 2020.⁷¹¹

As described in Chapter Two, human health impacts may increase in the U.S. from global warming in a number of ways: **Fatigue, sickness, dehydration or inability to leave the home during periods of extreme heat;**

Inability to leave the home during periods of extreme cold weather to buy food or get medical treatment;

More SO₂, NO_x, ground-level ozone and airborne particulate matter due to increased need to operate coal-fired power plants during periods of extreme heat;

Damage to lungs from increased forest fires;

Power outages during summer peak loads, leading to spoilage of food, spoilage of medicine, interruption of medical equipment in the home or inability to pump water, and

Increased disease from vector-borne diseases.

Managing all of these potential health impacts will challenge city governments, along with county, state and federal agencies. These impacts will likely afflict the sick and elderly more than younger or healthy people, but all ages are vulnerable.

The health impacts from heat waves have already been felt in many parts of the U.S. and Europe. For example, over 100 people died in California alone during July 2006 from heat-related deaths, a marked increase over previous years. In areas extreme heat has not previously been a problem, many people do not have air conditioners for their homes. Those that do may not be able to operate them when heat waves coincide with power outages, a confluence of events that is becoming more common.

Cities, working with county, state and federal agencies, are developing emergency protocol to address these challenging and varied problems. In the heat wave of 2006, a number of cities offered central “Cooling Centers” for people trying to survive extreme heat. For example, hundreds of Cooling Centers were set-up in cities across America, including Baltimore (11 centers), St. Louis (60), Chicago (100), and New York (over 300). Boston and Chicago has free air-conditioned shuttle bus services to transport vulnerable populations to

Cooling Centers, situated in community centers, police stations, libraries, park facilities and other locations.

Telephone hotlines, with up to date and accurate information on heat resources and medical advice were used in Chicago, Philadelphia and Boston. Chicago even had reverse 911 calls, automatically sent to seniors and those at risk. Some cities (Philadelphia, Baltimore and New York) went a step further and sent outreach workers to check on the homeless and elderly, providing water and fans. Chicago deployed air-conditioned buses to points around the city while Baltimore, St. Louis, Omaha and others helped provide and install air conditioners to those in need.

The city of West Palm Beach Mayor Lois J. Frankel announced that the city would extending the hours of its swimming pools to help residents and visitors beat the record-setting heat in summer. The city waived the fee to use the Warren Hawkins Aquatic Center at Gaines Park and extended pool hours.⁷¹³ Cities may have to work with clinics, hospitals and health-care providers to transport important medicines to disabled, frail or otherwise ill people trapped in their homes during periods of extreme heat or cold.

⁷¹¹ Planet Ark, www.planetark.org/dailynewsstory.cfm/newsid/22420/story.htm, 15 October 2006.

⁷¹² WHO, www.who.int/globalchange/climate/en/ccSCREEN.pdf, also archived at, www.climatemanual.org/Cities/Chapter5/Adapting/ccSCREEN.pdf, 15 October 2006.

⁷¹³ City of West Palm Beach, www.wpb.org/News/showStory.php?link=06-07-31CityTakingActiontoHelpPeopleDealwithExtremeHeat.php, 14 August 2006.

CASE STUDY: Philadelphia, PA

The city of Philadelphia began taking steps to reduce the public health threat from excessive heat in 1993.⁷¹⁴ The cornerstone of the city's response plan is its Heat Health Watch-Warning System (HHWWS). Under the HHWWS, city staff works with the National Weather Service to determine when a heat wave is imminent.

Once a heat alert is issued, the Philadelphia Health Department contacts news organizations with tips on how vulnerable individuals can protect themselves. People who do not have air conditioning are advised to seek relief from the heat in shopping malls, senior centers and other air-conditioned spaces.

In addition, the city's 6,300 "block captains" are notified and asked to check on elderly neighbors. Block captains are individuals appointed by the city to assist vulnerable residents in their neighborhood. The Public Health Department also takes the lead on activating a number of special summer heat responses, including:

Home-visits by field teams;

Activation of the Philadelphia Corporation for Aging's "Heatline;"

Enhanced daytime outreach for the homeless; and

A "Buddy System"

The Heatline initiative is a telephone-based service where nurses are standing by to assist callers who may be experiencing health problems. If callers are deemed at-risk, mobile units are dispatched to that individual's residence. The Buddy System is a city-sponsored outreach effort that encourages the public to visit older friends, relatives and neighbors during excessive heat events.

Buddy systems may have to be deployed in many U.S. cities to save lives during power outages and extreme weather conditions to transport high-risk people to cooler or warmer places or to deliver food, water or medicine.

⁷¹⁴ From EPA website, www.epa.gov/heatisland/about/heatresponseprograms.html, 12 August 2006.

CASE STUDY: Chicago, IL

Chicago's Action Plan for Extreme Weather Conditions⁷¹⁵

In the event that an extreme weather emergency is declared in Chicago:

The Department of Human Services operates 24-hour cooling centers and provides transportation;

The Department on Aging's senior centers have extended hours;

The Mayor's Office for People with Disabilities contacts more than 100 disability advocacy organizations, asking them to check on the health and safety of their clients;

Staff from the Department of Human Services, Department on Aging, and the Chicago

Housing Authority visits at-risk residents in their homes and telephones others to ensure they are well;

The Department of Public Health monitors nursing homes and hospital emergency rooms, and deploys mobile assessment teams of nurses;

The Department of Water Management closely observes water pressure around the city and shuts off illegally opened fire hydrants;

The Department of Buildings inspects high-risk buildings to ensure that windows are open and ventilation systems are functioning;

Extra tow trucks from the Department of Streets and

Sanitation are made available to assist stranded motorists;

The Chicago Public Schools limits students' strenuous activities and modifies dress codes; and

The Extreme Weather Notification System places automatic telephone calls to at-risk individuals in advance of a heat wave or severe cold (the calls consist of a recorded message of weather forecasts, safety tips and information on city services).

CONTACT

The Office of Emergency Management and Communications⁷¹⁶
(312) 746-9111
oemc@cityofchicago.org

⁷¹⁵ For more information about Chicago's and other cities' emergency action plans, please see EPA's website at: www.epa.gov/heatisland/about/heatresponseprograms.html, 12 August 2006.

⁷¹⁶ The Office of Emergency Management and Communications website, egov.cityofchicago.org/city/webportal/portalEntityHomeAction.do?BV_SessionID=@@@0043648670.1166219364@@@&BV_EngineID=ccceaddjdgjhicefecelldffhdfqm.0&entityName=Emergency+Communications&entityNameEnumValue=12, 5 December 2006.

Additional Resources

California Climate Change

Center: In 2003, the California Energy Commission, through its Public Interest Energy Research program, established the California Climate Change Center to undertake a broad program of scientific and economic research on climate change in California. The Center is organized as a “virtual” institution with sites at both the UC Berkeley campus and the Scripps Institute of Oceanography (UC San Diego campus). The Berkeley Center, based at the Richard & Rhoda Goldman School of Public Policy, is focusing on economic and policy analysis, while the Scripps Center focuses on physical climate modeling.
www.climatechange.ca.gov/research/index.html

“Climate Change 2001: Impacts, Adaptation and Vulnerability.” International Panel on Climate Change.
www.ipcc.ch/

“Coping with Global Climate Change: The Role of Adaptation in the United States”. Prepared for the Pew Center on Global Climate Change, June 2004
www.pewclimate.org/global-warming-in-depth/all_reports/adaptation/index.cfm



NATURAL CAPITALISMS SOLUTIONS IS A 501(C)3 NON-PROFIT ORGANIZATION
WWW.NATCAPSOLUTIONS.ORG ♦ P.O. BOX 398 ♦ ELDORADO SPRINGS, CO 80025
INFO@NATCAPSOLUTIONS.ORG ♦ TEL: 303-554-0723 ♦ FAX: 303-554-6548